A History of the Mobile District Corps of Engineers 1815 - 1985

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A History of the Mobile District Corps of Engineers 1815-1985

Prepared for
US Army Corps of Engineers, Mobile District

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2002

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Omissions are inevitable in a manuscript that is intended to be both sweeping and general. Every effort was made to touch on the many-faceted responsibilities of the Mobile District without being excessive, knowing that in covering of 170 years it is virtually impossible to include all of the important accomplishments of the District. I therefore accept full responsibility for errors of omission and fact. I hope that this history reflects the magnitude of activity within the Mobile District. I also hope the history illustrates the significant contribution the District has made to the region and nation, not just in fulfilling its governmental obligations, but in improving the quality of life within its jurisdictional boundaries.

A Chronology of Selected Events Relevant to the History of the Mobile District

1699	The French land on Ship Island, Mississippi Sound.
1700	Biloxi is founded.
1702	French establish Fort Louis de la Mobile in Mobile.
1711	French establish Fort Conde de la Mobile.
1812	British-American War is fought.
1814	British form blockade of the Atlantic coast. Fort Bowyer is built by British at Mobile Point.
1815	General Andrew Jackson defeats the British at New Orleans. Lieutenant H. Dumas is first engineer assigned to the Gulf Coast frontier.
1816	Lieutenant James Gadsden succeeds Dumas as Supervising Engineer on the Gulf frontier; General Simon Bernard is hired by order of President James Monroe; the Board of Engineers is created by War Department with Bernard in charge.
1817	Gadsden's final report on first engineer survey of Gulf frontier is submitted to General Swift, Chief of Engineers; is first report to General Swift on Gulf frontier by Bernard and Board of Engineers.
1818	Construction begins on Fort Gaines, Mobile Bay.
1820	Construction begins at fort on Mobile Point, Mobile Bay.
1821	United States acquires Florida. Pensacola is considered as site for Gulf frontier's major naval depot. Work is suspended on Fort Gaines.
1825	United States establishes Navy Yard at Pensacola.
1827	Tennessee Valley, Alabama, is surveyed to determine feasibility of connection with Gulf of Mexico via the Coosa River. First appropriations are made for improvement of Mobile Harbor.
1829	Construction begins on Fort Pickens, Santa Rosa Island, Pensacola Bay.
1833	Mobile-Pensacola Canal is surveyed.
1834	Construction begins on Fort McRae, Foster's Bank, Pensacola Bay.
1846	Congress reauthorizes construction on Fort Gaines.
1857	Construction begins on Fort Massachusetts, Ship Island, Mississippi Sound.
1861	Confederates first capture, then mysteriously abandon Fort Massachusetts; Federal troops occupy the fort.
1862	First circular earthenworks are constructed by Confederates around Mobile.

1863	Second circular fortifications are constructed around Mobile.
1864	Third series of circular fortifications are constructed around Mobile. Fort Gaines falls to Confederates. Fort Powell is destroyed. Battle of Mobile Bay is fought.
1870	Engineers receive first routine assignment to a Mobile Office. First major survey is done of the Coosa River.
1871	First surveys are conducted on the Apalachicola-Chattahoochee-Flint River system, including Apalachicola Bay.
1872	Last serious attempt is made to determine feasibility of connecting Tennessee River and Gulf of Mexico via the Coosa River. Robinson conducts major survey of Tombigbee River and concludes that the river is unworthy of improvement.
1874	Surveys of Black Warrior River to determine feasibility of improvement.
1875	Initial surveys are conducted for improvement of the Alabama River.
1878	Improvements begin on Pensacola and Pascagoula harbors.
1879	First surveys are conducted on the Pearl River.
1884	Responsibility for improvement of the Pearl River system is shifted from New Orleans District to Mobile.
1885	The Endicott Board is created.
1888	Mobile and Montgomery Districts are formally established.
1899	Improvements begin on Gulfport Harbor. Aquatic plant control is authorized by Congress.
1905	The Taft Board is created.
1909	President Roosevelt persuades Congress to fund surveys for purpose of a national inland waterway system, thus a significant year for development of the Gulf Intracoastal Waterway.
1913	Most extensive survey of Coosa River — undertaken to determine if reservoirs on stream could be used for power generation.
1927	Great Flood on the Mississippi River creates intense national awareness of problem of flood control. First permanent construction begins at Maxwell AFB, Montgomery.
1928	Flood Control Act calls for investigation of tributary reservoirs as means of controlling flooding; 308 reports.
1929	Cantonment McClellan is changed to permanent fort. The Air Corps Tactical School is transferred from Langley Field, Virginia, to Maxwell AFB in Montgomery.
1930	Corps of Engineers is given responsibility for shore protection.
1933	Montgomery District is merged with Mobile District; current District boundaries are stabilized except for minor alterations.

1935	Slackwater navigation improvement of Tombigbee River is abandoned.
1936	Flood Control Act authorizes Corps of Engineers as major agency responsible for flood control protection investigations and river improvements.
1938	Gulf Intracoastal Waterway is completed through the Mobile District.
1939	Construction begins at Brookley Field, site of Southeast Air Depot.
1940	Army airfield construction is transferred from Quartermaster General to Corps of Engineers.
1941	All military construction responsibility is given to Corps of Engineers. Redstone Arsenal is established, one of eight permanent Ordnance Corps arsenals in United States. Construction begins at Keesler AFB, Biloxi, Mississippi.
1942	Emergency construction is initiated to widen the Gulf Intracoastal Waterway to accommodate larger vessels carrying supplies for the U.S. war effort. Ozark Triangular Division Camp is occupied by Army, renamed Camp Rucker in 1943. Construction program for prisoner-of-war camps is initiated by War Department. First POW camp in Alabama is constructed at Aliceville. Dog training project on Cat Island uses Japanese-American soldiers as live targets.
1943	Construction of Opelika POW camp is completed. First prisoners arrive for camps in Alabama. Chemical Warfare Service does biological warfare testing on Horn Island.
1944	Flood Control Act establishes Corps governing policy for flood control; focus of Corps responsibility shifts from navigation improvement to flood control.
1946	Congress authorizes construction of the Tennessee-Tombigbee Waterway.
1949	Ordnance Rocket Center is placed at Redstone Arsenal.
1950	Federal Disaster Act establishes authority of Federal government to assist citizens with disaster relief through Office of Emergency Planning (OEP), which frequently relies on Corps of Engineers. Wernher von Braun and associates are relocated from Fort Bliss, Texas, to Redstone Arsenal.
1956	Army Ballistic Missile Agency is established at Redstone Arsenal.
1957	First successful American anti-ICBM is fired. Nike-Zeus program is headquartered at Redstone Arsenal.
1959	NASA is established at Redstone Arsenal for Saturn project.
1961	Mobile District is made responsible for construction of the Mississippi Test Facility for NASA (operational in 1966). Work begins on J-4 test facility at Arnold Engineering Development Center in Tennessee.
1962	West Point Dam is authorized by Congress.
1966	National Historic Preservation Act is passed giving Corps responsibility for cultural resource management.

1967	Huntsville Engineer District is created within Mobile District.
1969	Hurricane Camille, worst storm ever to hit North American coastline, slams into Mississippi Gulf coast. National Environmental Policy Act (NEPA) is passed.
1970	Construction responsibility for Cape Canaveral District is shifted to Mobile District Office. Mobile is assigned military construction responsibilities for Jacksonville District, including Panama Canal and Central America.
1971	Formal dedication ceremonies initiating construction of the Tennessee-Tombigbee Waterway are held in Mobile. President Nixon is keynote speaker.
1972	Construction of the Tennessee-Tombigbee Waterway begins at Gainesville Lock and Dam. Federal Water Pollution Control Act (FWPCA) is amended significantly: sections 301, 402, and 404 are most significant for Corps.
1973	West Point Lake is declared a national recreation demonstration project by the Chief of Engineers.
1977	Construction is initiated on Aeropropulsion Systems Test Facility at Arnold Engineering Development Center (completed in 1984).
1979	Hurricane Frederic hits Mobile.
1981	District becomes responsible for rehabilitation of the Shuttle Payload Integration Facility at Cape Canaveral.
1985	Tennessee-Tombigbee Waterway is opened to navigation.

Introduction

The Corps of Engineers is an American institution, and work of the Mobile District represents only one chapter in a long and distinguished history. The Corps was founded in principle when the Continental Congress authorized the positions of engineer chief and two assistants. Along with his general military responsibilities on the eve of the American Revolution, George Washington was authorized to established the first engineer corps. Because of the lack of qualified American personnel, foreign expertise was sought from among America's allies. As a result of a diplomatic accord with France, numerous French military officers offered their services to General Washington. While the use of French military was well received, negative aspects would surface later.

The Corps of Engineers was organized formally in 1779. The early years were unstable; the Corps was dissolved in 1783 only to be reactivated in 1794. Parallels can be drawn between the Corps' formative years and the history of the Mobile District. After each war in the United States, Congress and the public called for a major reduction in military strength and operations during peacetime. The waxing and waning of military responsibility is reflected in the operations of the Mobile District until the Korean War. Since the 1950's military and civil responsibilities have been carried out concurrently.

From its inception, the Corps of Engineers has enjoyed privileged status as an elite engineer organization. Special duties of the Corps were described in a communication from Secretary of War James McHenry in 1800. He stated the services of the Army Engineer were not limited to constructing and repairing fortifications. McHenry went on to say that military service was but one, although important, facet of the engineer profession. Corps skills extended to almost every area of defense and to civil works including building roads, canals, and bridges. The Secretary of War considered the formation of an engineer corps from its own rank and file as vital to the well-being of the nation.

While it was the first indication of the Corps' special role in assuming military and civil responsibilities, McHenry's statement was equally clear about the organization being formed for military purposes. The Corps was reorganized soon after (in 1802), and a permanent headquarters was established at the Military Academy at West Point, New York.

From its inception, the engineer corps was to be a special branch of the military. An important aspect of the organization was its availability for deployment in the field, on the frontier, and in fortifications of the seacoast. In addition, the engineers would be available for deployment by the President as he deemed consistent with public service.

The Corps' singular responsibility for engineering duties or assignments directly ordered by the President became codified into law early on and remains in effect to this day. The law, enacted on 10 April 1806, states the following:

> The functions of the engineers being generally confined to the most elevated branch of military science, they are not to assume, nor are they subject to be ordered on any duty beyond the line of their immediate profession, except by the special order of the President of the United States, ...

The Corps' involvement in the Gulf coast region spans more than 175 years. The Mobile District Office has supervised Corps projects there over the last 100 years. The Corps' reorganization into Divisions and Districts came about after the Civil War. An engineer office, for example, was established in Mobile in 1870, but the formal designation as a

District did not occur until 1888. Prior to the Civil War, engineers on the Gulf frontier were assigned to fortification project sites. Also they were given responsibilities for river surveys and examinations within the vicinity of their assigned forts.

Officers assigned to the Gulf frontier generally were stationed at New Orleans, Mobile, or Pensacola because these were the only significant population centers for the region. The territorial limits of authority for an officer, however, were never defined, and the paucity of officers during the first half of the nineteenth century meant that individuals had to assume responsibility for large portions of the Southern frontier. An officer stationed at Pensacola or Mobile Point could be assigned surveys as far west as the Sabine River or as far east as Tampa Bay. For the most part, however, engineers supervised the construction of a series of forts that were part of the country's first nationwide defense system.

The first engineer was assigned to the Gulf frontier in 1815 to assess the nation's military vulnerability following the War of 1812. His task was to examine the conditions of existing forts, recommend new fort sites, and make observations on the nature and character of the region that would be useful to the military. The earliest engineers on the Gulf frontier had only minor civil responsibilities.

The early military surveys revealed that the Gulf region was important to the nation's defense, and its potential for economic and commercial development was significant as well. Soon Corps officers were called on by Congress to develop the best plan for connecting the Southern frontier to the economic prosperity unfolding in the nation at large. National politics caused the Corps to evolve into a special government agency, with an expanding role in the military and domestic development of the nation.

Initially, military activities took priority over civil projects. Later, military and civil workloads assumed a roller coaster pattern of highs and lows. By World War II, the decision was made to pursue the Corps' various missions on a dual track of military and civil operations.

The Mobile District has gone through a multi-phased evolution. Phase one began with a nondefined portion of the Gulf frontier. The second phase began with the establishment of a regional office following the Civil War, but without defined project boundaries. The third phase was marked by the establishment of a formal District in 1888. For the first time, the District's territorial boundaries were delineated, and Mobile became responsible for river basins in the western portion of Alabama and the eastern portion of Mississippi. The fourth phase of reorganization came in 1933 with the merger of the former Mobile and Montgomery Districts, and establishment of the current Mobile District boundaries.

The Mobile District has a long, complex, and exciting history characterized by the Army engineers' relationship to the environment and the people of the central Gulf of Mexico region. The conflicting military and civil priorities prior to the milestone decision to maintain parallel emphasis has made it somewhat difficult to divide the District's history into discrete units. Therefore, the reader needs to be sensitive to some overlap between various periods. One example of a major project that spanned more than one phase is the Gulf Intracoastal Waterway. This project, which began in the early twentieth century and was not completed until mid-century, had its historical roots in surveys conducted along the Gulf frontier in the 1820s and 1830s. To cover its history, one must tell an interrupted story that spans 120 years.

Events prior to Reconstruction are referred to as the Formative Period and span 1815 to 1865. The most important operations during this period focused on the development of a seacoast fortification system, to protect the United States from a military invasion such as occurred during the War of 1812. The few officers available to supervise the construction of forts had to contend with a hostile frontier environment. The sparse population and the dismal transportation infrastructure hampered the Corps' efforts to accomplish its mission.

The forts considered essential for defense by the Board of Engineers on Fortifications were constructed, albeit piecemeal. Natural hazards such as the seasonal fever epidemics and violent weather meant numerous delays. Lack of materials hampered construction as well. Skilled labor and some materials had to be imported. Most supplies came through New Orleans, the major port on the Southern frontier, but sometimes came directly from the North to Mobile Point or to Pensacola. Because New Orleans was the major supply point, some of the earliest efforts to improve navigation in the region were designed to connect New Orleans with other Gulf ports. The earliest canal reconnaissances were precisely that, primarily for military reasons, but the genesis of the Gulf Intracoastal Waterway was established.

The Civil War represents the only break in an otherwise continuous Corps presence along the Gulf of Mexico since 1815. In 1861 many excellent Army engineer officers resigned their commissions and joined the Confederacy. They, in turn, formed the nucleus of a short-lived Confederate Corps of Engineers. The Corps had little impact in the region during this period, although it later was charged with removing Confederate obstacles to navigation, restoring and improving navigation capabilities across the entire coastal front, and renewing the area's military strength through reconstruction of the old fortification system it had previously built.

The period following the Civil War saw many river and harbor improvement projects. The nation focused on expanding its economic prosperity and the public clamored for Congress to speed up commercial development by improving navigation across a broad front. Public demand resulted in passage of annual river and harbor acts designed to develop the nation's water resources. The last quarter of the nineteenth century and most of the first quarter of the twentieth century marked a significant period in river and harbor legislation.

It was during this period that the various engineer Districts were established. Projects were assigned informally for years to officers stationed in various cities. Surveys and examinations of rivers and river segments were meted out to the engineer closest to the project site. Gradually, the area of civil responsibilities conformed to particular river basins or portions thereof. In 1888, the Chief of Engineers was authorized to organize the Corps into five Divisions, with as many Districts within each Division as the Chief deemed necessary to accomplish the tasks assigned by Congress. Districts were not outlined at the time, instead engineer officers were designated to serve under each Division Engineer. The Annual Report submitted by each officer indicated the territory for which each was responsible for. Annual reports were written on the basis of work completed on river systems or on portions of streams. The inference is that a river basin approach was accepted as proper procedure for assigning tasks. The first maps to formally outline basins assigned to each District date from the early twentieth century. A comparison of the 1912 maps (showing the various rivers) with the Annual Reports from the 1880s indicates that the distribution of assignments by river basins was already in effect when the Districts were formalized, and that few significant changes occurred by 1912.

The eastern river basins in Alabama and in western Georgia were assigned to an officer stationed in Montgomery, Alabama. Western basins in Alabama and eastern basins in Mississippi were assigned to Mobile. An equitable distribution also was made of coastal areas. The Montgomery District was responsible for the area east of Mobile Bay to St. Marks River, Florida. Mobile Bay westward to the Pearl River in Mississippi was assigned to the Mobile office.

The major engineering efforts over the next 50 years were devoted to opening river channels and deepening various harbors to improve navigation. Nearly every community could justify the need to develop the water resources nearest its location. A primary goal of the government in taking on navigation improvements was to equalize rate structures between rail and water carriers. In many instances, the Corps' improvement of river channels caused freight rates to be reduced immediately. However, the completion of a project sometimes had little effect at all on transportation rates.

Corps navigation projects were somewhat routine. The major efforts consisted of removing reefs and other obstructions from channel segments, removing snags and sunken logs deposited during floods or brought downstream by freshets, and dredging sand and silt from channels. In addition, overhanging trees presented a major hazard to steamboat navigation, common during the period. Overhanging trees often knocked smokestacks over and created fires. Harbor improvements involved removing the sand that clogged the channels, caused by natural wave and current action or a result of ship movement.

Additional responsibilities were outlined in navigation improvement legislation. An 1866 act, for example, specified the information each officer was required to submit in his annual report. This included the results of each survey or resurvey; the time required to complete a project; the amount of money that could be profitably expended in the coming year; the district in which the work was located (generally the military district because Corps Districts had not been established); the location of the nearest port, lighthouse, or fort with respect to the project; various navigational and commercial statistics; abstracts of contracts for materials, labor, and supplies; and complete and accurate accounting for all funds received. Each year's appropriation bill requested the same data, which became fundamental for justification of budget requests from the Corps. Official Corps correspondence includes many reminders to officers that their monthly reports were late or incomplete as to the required statistical or accounting data, an indication of how seriously the Office of the Chief of Engineers took the legislation. Failure to keep meticulous records concerning handling of funds got more officers into trouble than anything else. The first engineer assigned to the Gulf frontier, Lieutenant Hipolyte Dumas, was ultimately dismissed from the Corps for gross dereliction of duty, much of which related to mishandling of funds.

Another piece of legislation during the river and harbor period had far-reaching effects on all Corps Districts. The law provided for the establishment of harbor lines and included the regulatory authority for determining spoil sites for debris from mining or industrial mills to protect navigation within harbors. The law was strengthened until it gave regulatory authority for granting of permits for the construction of any structure that might affect navigation. In 1899, sweeping legislation made it unlawful to build any structure or to make any alterations or excavations, "in any port, roadstead, haven, harbor, navigable river, or other water of the United States, outside established, except on plans recommended by the Chief of Engineers, and approved by the Secretary of War." Significant navigation improvements were made between 1865 and World War I. Major surveys were made on the Coosa, Tombigbee, Warrior, Black Warrior, Chattahoochee, and Pearl Rivers. In addition, surveys and examinations were made on hundreds of smaller streams and rivers, or on segments of the larger rivers in the various river basins. The prime means for improving rivers during this period was through slackwater navigation, which was accomplished by constructing dams and locks. Because steamboats were the most common vessels moving on these rivers, channel depths were modest; no more than three feet for low-water periods was typical. Dams were constructed at major reefs or shoals and accompanying locks allowed boats to be lifted to the newly created levels. The dams served to back up water and created calm pools for navigation, hence the term slackwater.

Harbor improvements were completed as well. Mobile, the chief port on the Gulf after New Orleans, as the major benefactor. There, channels were dredged to open up the city wharves to the larger draft vessels that were beginning to dominate coastal trade. Channels were deepened in other smaller ports to enhance interregional commerce.

The latter part of the river and harbor period coincided with World War I. During this period, civil projects tended to decline precipitously whenever military activity increased. Thus, with America having to mobilize rapidly, all attention was focused on military construction. Although the Corps constructed numerous camps and cantonments, control of operations was vested in the Quartermaster General's Office. The Corps felt it was better qualified to handle the engineering requirements, and rightly so. Nonetheless, a political power struggle between the two agencies was not resolved until World War II. During World War I, Corps activity in the Mobile District was restricted mostly to flood control projects and some minor recreation ventures.

Civil activity resumed following World War I. River and harbor work focused on harbor development. River traffic had diminished significantly by this time, the victim of an expanding rail network. Navigation improvements became less cost efficient because of the ongoing work necessary to accommodate larger vessels. Also, channel improvements seldom were considered permanent because rivers were constantly shifting. Nonetheless, some improvements were accomplished, including the major reworking of the Warrior-Black Warrior basin.

Flood control became a dominant issue during the early period of the modern era (1919-1985). The great flood of 1927 riveted the nation's attention on the danger of rampaging rivers. While the Mississippi system was the hardest hit, major rivers in the Mobile and Montgomery Districts also flooded. Mounting public pressure called for action to alleviate the destruction and misery caused by the periodic flooding on the Chattahoochee, Tombigbee, and other rivers.

The passage of flood control legislation increased the Corps' national role in protecting the public from flooding and in managing the nation's water resources. The accepted approach was reservoir construction to manage floodwaters through controlled release. Gradually, however, flood control legislation called for expanded responsibilities in managing water resources. Projects became multipurpose: flood control, power generation, and recreation. As reservoir construction increased, the Corps' regulatory function increased as well. It was during the period 1939 to 1970 that the Corps also ran into its greatest public opposition to its mission: concern over environmental damage. Every District had to contend with some public opposition to its projects. The largest civil project of its kind in the world, the Tennessee-Tombigbee Waterway, was constructed in the Mobile District. Because of the controversy it engendered, Tenn-Tom served as a catalyst for environmental protectionism and in turn protective environmental legislation. As a direct result of this project, the Corps reassessed its mission and adopted a new direction.

After the passage of environmental legislation and the creation of the Environmental Protection Agency (EPA) as an environmental watchdog in the 1970s, the Corps took a new approach to managing water resources. A comprehensive river basin approach was strengthened and the roles of the engineers and the public were defined more clearly. The public now had more direct access to the engineer organizational structure and thus an opportunity to contribute to the planning of water resources projects. The public also had to bear a greater share of the cost of constructing projects intended to protect their locales or to enhance their quality of life.

Another important change during the modern era was the merger of the Montgomery and Mobile Districts to establish the current Mobile District. District boundaries have changed little since 1933, the most notable being the transfer of the Pearl River basin from Mobile to the Vicksburg District. In addition to all of the additions and changes in environmental regulatory authority, the Mobile District became a significant partner in managing Federal disaster relief. Two devastating hurricanes, Camille in 1969 and Frederic in 1979, caused severe property and environmental damage in the Mobile District. The Corps became the chief agency, working through the Federal Emergency Management Agency (FEMA), for disaster cleanup; assistance to displaced persons; and environmental restoration following hurricanes, tornadoes, and other violent weather phenomena.

During the modern era, a significant decision was made concerning the dual role of the Corps of Engineers. A consequence of World War II, the decision involved the nation's ability to mobilize rapidly for conflict. It was determined that the United States should maintain a state of military preparedness at all times. In both the world wars, the country was unprepared for the huge mobilization that ensued. Construction of camps to house and train troops put significant stress on the nation's resources and skills. Thus, it was considered more efficient to maintain fortifications and military installations in a state of preparedness. At the same time, civil operations vital to the nation's growth were deemed too important to put in abeyance during wartime. The organizational structure of the Corps changed to accommodate the new dual mission, and the arrangement continues to present.

Although discussing the District's military function separate from the civil operations seems logical, many of the projects coincide historically. From 1870 to 1920, the military emphasis concentrated on restoring a seacoast defense system that dates back to the 1820s. Many of the original forts had to be abandoned. Dramatic strides in armament technology led to the refurbishing of many coastal forts, most notably Fort Morgan and Fort Pickens in the Mobile District. Military philosophy shifted after the Civil War with the knowledge that new projectiles being developed in Europe, and later in the United States, would require different methods of defending the coast. In addition, the aircraft introduced following World War I gave rise to a new period in fortifications.

Because the Corps was not directly responsible for construction, the World War I military operations were minimal. In 1940, substantial authority for Army construction shifted to the Corps of Engineers. The total transfer of all Army construction to the Corps was made final in December 1946 and continues to this day. Camps became permanent during World War II, constituting a significant construction agency for other Federal entities (most notably the Air Force). The Mobile District constructed such major facilities as Brookley Field and Eglin, Tyndall, and Keesler Air Force Bases.

In the aftermath of World War II, the Mobile District became involved in the nation's guided missile program. The last 30 years, 1955 to 1985, have focused primarily on Corps assistance to the Air Force and Army in development of facilities for the construction and testing of missiles and rockets. Among the major projects the Mobile District constructed are the Mississippi Test Facility for testing the National Aeronautics and Space

Administration's (NASA) Saturn rockets, and the Arnold Engineering Development Center for testing jet propulsion engines for the Air Force Systems Command. The District also rehabilitated the Solid Motor Assembly Building and Shuttle Payload Integration Facility for NASA at Cape Canaveral.

The Mobile District absorbed responsibility for Cape Canaveral in 1970, along with military construction responsibility for all of Central and South America and the Caribbean Basin. The most significant projects have been construction additions and alterations resulting from the treaty between the United States and Panama over future control of the Canal Zone. The conflicts in Grenada, Honduras, Nicaragua, and El Salvador in Central America and the Caribbean have spurred Mobile District activity in the construction of support facilities for American allied troops in the region.

Because the role of the Corps of Engineers is changing again, this history concludes with an assessment of the Mobile District's future as it responds to national interests and the needs of the public. The District has had a major positive impact on the lives of millions of citizens within its boundaries. In addition, it has contributed significantly to the scientific and technological development of the nation, and its security both at home and abroad. All indications are that the Mobile District will continue to be a major player in the future development of civil and military engineering.

Part 1 - The Formative Period, 1815-1865

I. The Gulf Frontier, 1815-1831

The Gulf of Mexico coast was well known to European explorers by the early eighteenth century. By the early nineteenth century, they also knew the advantages offered by the Gulf coast's numerous harbors, although none had been developed to any extent. Mobile, Pensacola, Tampa, Biloxi, and New Orleans were first settled by the Spanish and French in the region. The French were quick to recognize the strategic importance of Mobile and established a fort there in 1702. Biloxi was founded in 1700, but d'Iberville, a French explorer, suggested to the court at Versailles that Mobile Bay be developed as the center of resistance to English expansion into the North American interior. That role, however, was assumed by New Orleans.[1]

Settlement in the eighteenth and early nineteenth centuries was concentrated along the inlets of rivers flowing into the Gulf of Mexico; these first settlers recognized the rivers' potential commercial value. The Corps of Engineers began in the early decades of the nineteenth century to assume responsibility for much of the development of the nation's waterways and was to become instrumental in developing many of the Gulf rivers for strategic and commercial affairs.

The U.S. government's interest in the Gulf region was a direct consequence of the War of 1812. The young nation was made painfully aware of its naval vulnerability, particularly along the sparsely settled Gulf coast. The British siege on New Orleans, one of America's most vital ports, illustrated the need for a more adequate defense of the coastline and for protection of commerce on the high seas.[2]

Despite America's naval prowess, the British managed to blockade the Navy in ports along the eastern seaboard by early 1814. British efforts to defeat the United States also focused on the Gulf of Mexico and the capture of New Orleans. While American troops were fighting the British in New England, Canada, and the Chesapeake Bay area, Andrew Jackson was waging war against the Indians in the Old Southwest: the Mississippi Territory that included much of what is now the Mobile District. His successes against the Creeks resulted in the Federal government giving him command of all forces in the Southwest and orders to defend New Orleans.

Jackson feared the British would use Spanish-held Pensacola as a base for penetration into the Gulf interior. After defeating the Creeks and capturing the interior towns and forts, he marched to New Orleans. Jackson's January 1815 victory against General Edward Pakenham's forces was the last military engagement of the War of 1812. The Gulf frontier was saved with a minimal loss of American life or damage to property, and the military operations in the area initiated a new period in U.S. military preparedness.

The government's concern about naval vulnerability led to exploratory expeditions in the Gulf area. The Navy employed James Cathcart to scout public lands for stands of red cedar and live oak for use in constructing new vessels. Cathcart's detailed observations of the area around Mobile in 1819 revealed the difficulty early settlers faced in occupying this remote area. He described the land as a sandy pine barren devoid of vegetation. Perhaps more important for the Engineer officer assigned to the Gulf was Cathcart's observation that the area was so isolated that all supplies had to be brought down the Mississippi from northern states.[3] The difficulty in securing building materials, equipment, and skilled labor to construct authorized projects on the pre-Civil War Gulf frontier would be a major challenge to Engineer officers.

William Bartram, an early traveler in the southeastern United States, was more poetic in his description of the territory. He frequently mentioned the sparse population and the incredible diversity of vegetation. He described massive stands of virgin timber, Indian old fields (abandoned Indian fields important later in white settlement of the area), and the general topography and weather.[4] His journals reveal the type of territory that the first Engineers in the Gulf region encountered.

The First Survey

The Treaty of Ghent, which officially ended the War of 1812, was signed in Belgium on 24 December 1814. The first official orders from the Chief of Engineers concerning the Gulf frontier were issued to Lieutenant Hipolyte Dumas on 4 May 1815. Dumas, a native of Pennsylvania and an 1813 graduate of West Point was instructed to:

> proceed to Mobile and New Orleans and examine the state of works for the defense of those places, which you will report to me, ... you will examine water courses, roads and passes, leading to and from Mobile and New Orleans and will select positions on which it may be necessary to erect works for the additional security of the before-mentioned places-I wish a good topographical map of the country from Pensacola to Lake Barataria, west of New Orleans.[5]

General Joseph G. Swift, Chief of Engineers, called for "general observations" on any site having strategic military value. Dumas was directed to determine drafts for vessels entering Lake Pontchartrain and Lake Maurepas, and to collect details useful for commercial as well as military activities. In addition, he was told to estimate the number of men needed for peacetime purposes at each existing fortification.

Unfortunately, Dumas failed to carry out his orders. For reasons not readily apparent, he was not adequately prepared for the assignment and grossly mismanaged his responsibilities. The record shows that he never completed the survey he was ordered to perform, and was relieved of direct responsibility for the first Gulf frontier survey shortly after his arrival.[6] Dumas continued to have difficulties in the Corps of Engineers and eventually lost his commission.[7]

In January 1816, Swift ordered Lieutenant James Gadsden, a West Point officer and native of South Carolina, to proceed to New Orleans. He was to pass through Nashville where he would call on General Jackson and inform him of Swift's orders that Gadsden inspect or examine all defense positions on the Gulf frontier that currently existed or that would be necessary for the security of New Orleans and Mobile.[8]

Swift was concerned that New Orleans would be cut off in a military skirmish. He ordered Gadsden to prepare a report for him and General Jackson that encompassed the orders previously given to Dumas, in essence a thorough topographic, military, and commercial reconnaissance. In addition, Gadsden was to direct Dumas and Lieutenant Robert W. Pooler, an Engineer officer from Savannah, to conduct such repairs to fortifications in the area as Gadsden deemed necessary. Once this activity was underway, Gadsden was to return to Washington, stopping in Knoxville, Tennessee, to report to Swift. He also was to inform Swift of the best site for a second military academy, a project that elicited much interest in Congress but that never came to fruition.[9]

Dumas and Gadsden clashed from the start. However, a letter from Swift made it quite plain to Dumas that Gadsden was in charge:

> I learn that you have been ordered by Lt. Gadsden to make arrangements preparatory to commencing repairs upon Fts. St. Philip and St.John. I have directed Lt. Gadsden to inform you of his plans for the repair of these forts, upon receipt of which information you will consider yourself as engineer for those repairs and commence them accordingly agreeably to the plans proposed by Lt. Gadsden. You will report to me at the close of every month the progress you make and the amount you have expended....[10]

While Lt. Dumas was the first Corps officer on the Gulf frontier, credit for successfully serving as the first officer and for completing the first survey of the Gulf frontier rightfully belongs to James Gadsden.[11] The first survey was ordered in May 1815; Lt. Gadsden completed it in May 1816 and filed the first report on reconnaissance of the Gulf frontier.

While Gadsden was surveying the Gulf of Mexico from Perdido Bay in West Florida to Sabine Pass on the Texas frontier, the Corps' central administration was changing. A joint resolution of Congress dated 29 April 1816 gave President Madison the authority to hire a "skillful assistant" for the Corps of Engineers. General Simon Bernard, one of Napoleon's engineers, was chosen. During the last quarter of the eighteenth and first quarter of the nineteenth centuries, French engineers were among the most respected in the world and their military achievements were legendary. The appointment of a foreigner to a position of equal rank with the Chief of Engineers, however, caused immediate morale and command problems. Coincident with the presidential appointment of Bernard, the War Department created a Board of Engineers for Fortifications. The board was to assess U.S. fortifications and make recommendations to the Secretary of War. Bernard was placed on this board along with Colonel Joseph G. Totten and Colonel William McRee.[12]

Upper level administration resulted in duplication of efforts in the field. Bernard and the Board of Engineers surveyed the Gulf frontier at the same time Gadsden was engaged in his survey. Gadsden was under direct orders from Swift, Bernard's most critical opponent; Swift considered him to be in charge of fortifications in the southern military division of the United States.[13] Gadsden's first report to Swift was followed by a final report on the frontier's condition in November 1817. Bernard filed a report in December 1817.[14]

Gadsden's report reviewed the status of Gulf coast fortifications in the immediate aftermath of the War of 1812. Defense of the Mississippi River and of New Orleans was considered paramount to that of other locations along the coast. Forts from the colonial period already existed along the Gulf. The most important Mississippi River fort was Fort St. Philip, located at Plaquemine Bend south of New Orleans. Gadsden commented favorably on the design and location of this fort and recommended strengthening it. He felt that the smaller forts near New Orleans, many of which were in decay, offered little protection.

The defense of Mobile and its bay was tied to Fort Charlotte (old Fort Conde) in Mobile and Fort Bowyer (built by the British) at Mobile Point. Fort Charlotte was described by Gadsden as so heavily encroached upon by Mobile that its defense function was compromised. In addition, it could protect only one channel leading into Mobile Harbor (and one that could be used only by small vessels). Larger vessels used Spanish River and were able to pass the city out of range of its best cannon, further compromising Mobile's defense. Fort Bowyer was deemed unsuitable to protect the entrance to Mobile Bay; a new fort of considerable dimensions would be required.

When Gadsden submitted his final report, he described the country as one of extensive swamps (Figure 1-1); prairies; and dissected lakes connected by rivers, bayous, and canals. His topographic map accompanying the survey highlighted the difficulty in traversing the area, which supported his position that Gulf fortifications would be costly to construct because of higher labor, material, and transportation charges. Because of the urgent need to deliver a report to Gen. Swift, the costs of repair and construction of fortifications were only estimated. Lt. Gadsden used a 20 percent figure for the added costs of labor, materials, and transportation. Gadsden's report included two important facts: (1) the countryside presented logistical problems for the Engineer officers responsible for fortifications and (2) of the eight or so fort sites, those at Plaquemine Bend on the Mississippi River and at Mobile Point were the most significant.

Captain Gadsden's (he had been promoted) second report covered Gulf rivers in some detail. He noted that rivers were obstructed at their mouths by sand and mud bars, which often precluded all but the smallest vessels from entering the rivers. Gadsden believed that if these obstructions were removed, there would be sufficient depth to accommodate the largest vessels. He provided detailed supporting data for navigation on a number of the rivers.

Gadsden viewed the Pearl River as a physiographic division. East of the Pearl River to Mobile Bay the Gulf coast was characterized by extensive sand beaches, a regional characteristic quite different from the Louisiana coast to the west. Along the eastern stretch of the coast were occasional interruptions by such minor rivers as the Wolf and Pascagoula, which afforded meager commercial advantages to the small settlements at their mouths.

Gadsden described Mobile Bay as "spacious, furnishing under the protection of Mobile Point, safe harbor and convenient anchorage for vessels of any burthen."[15] He described channels and depths, and his survey included the chain of barrier islands located at irregular distances of 12 to 20 miles from the mainland and stretching from Mobile Point to the Sabine River. These barrier islands played a significant role in later Corps activities in the area. The relatively protected waters between the barrier islands and the mainland, known as the Mississippi Sound, was considered a strategic connection between Mobile Point and the entrance to Lake Pontchartrain.

Gadsden also reported details on existing forts. Hasty observations had been included in his 1816 report; those made in 1817 were more thorough. Fort Charlotte was described as a casemated, regular bastioned fortification on a square with revetments of masonry (see the Glossary for fortification terms). Although the fort was well planned and soundly constructed, he felt the structure suffered from lack of regular maintenance. The glacis, for example, was never completed, and the counterscarp of the ditch needed repair in several places. The barracks in the interior were decayed and not habitable. While the fort was unsuitable for the defense of Mobile Bay, Gadsden recommended it be used as a depot.

Figure 1-1 Appalachicola [sic] River. This eighteenth-century lithograph of the Gulf frontier represents general environmental conditions encountered by the first Engineers. (Library of Congress).

Fort Bowyer was described as a circular battery enclosed in the rear by two curtains and a salient bastion (Figure 1-2). The entire structure was elevated about 18 feet above sea level. The revetments were timber filled with sand and extensively decayed. Gadsden maintained that the fort was totally inadequate and not worthy of restoration. He felt that a new fort was needed.

Gadsden's second report stressed the difficulties in procuring supplies and protecting health. The frontier environment continued to interfere with the timely completion of the Corps' responsibilities. Correspondence between the officers on the frontier and administrative officials in Washington, both military and congressional, indicated that the constraints imposed by the environment were never fully understood or were simply ignored. Local conditions affected virtually every project authorized for the Corps' mission of strengthening the southern defenses. Years before any funds were appropriated or any actual construction began, Gadsden and other officers predicted increased costs for the completion of any project.

The difficulty in constructing public works on the Gulf frontier resulted from scarce supplies, unhealthy weather, unreliable labor, and exorbitant contractor surcharges. Chronic labor shortages forced the government to rely on slaves rented from plantation owners in the construction areas. Gadsden regularly addressed the labor problem in his correspondence to Washington. He casually proposed that the government purchase 50 to 100 slaves, in either the Carolinas or Virginia, and transport them to a fort construction site. Once the fort was completed, the slaves would be given their freedom. This scheme would absolve the government from participating in an institution to which it was philosophically opposed. No evidence exists the government ever responded to his proposal.

Bernard's Report on the Southern Frontier

Bernard's 60-page report was divided into five sections: (1) a general reflection on the nature of the frontier, (2) a topographical description, (3) strategic operations, (4) an examination of the existing forts, and (5) projected forts and the costs of construction.[16]

Bernard's report criticized the Corps' work on the Gulf frontier; his projection for fortifications became the basis for fort construction on the Gulf frontier until after the Civil War. The fort at Mobile Point was designed after European models, which reflected Bernard's French training. The fort was to be a dry moat, pentagonal structure with a location Bernard claimed was easily defended and "healthful in all seasons." His latter conclusion was fallacious because yellow fever and malaria took their toll. The completed structure at Mobile Point would house 900 men: one third on duty, one third ready to march, and one third at rest. Bernard's report recommended a fort for Dauphin Island similar to that on Mobile Point.

Additional Surveys

General Swift resigned in 1818 because of his objection to Bernard's appointment as assistant to the Chief of Engineers. The Corps leadership continued to resent the appointment of a foreigner to a position other than that of teaching at West Point. Colonel Walker K. Armistead served as Chief until 1821, when he was replaced by Major General Alexander Macomb. Construction of the fort at Mobile Point had begun in 1820, and in August 1821 Macomb ordered an additional survey of the Gulf.

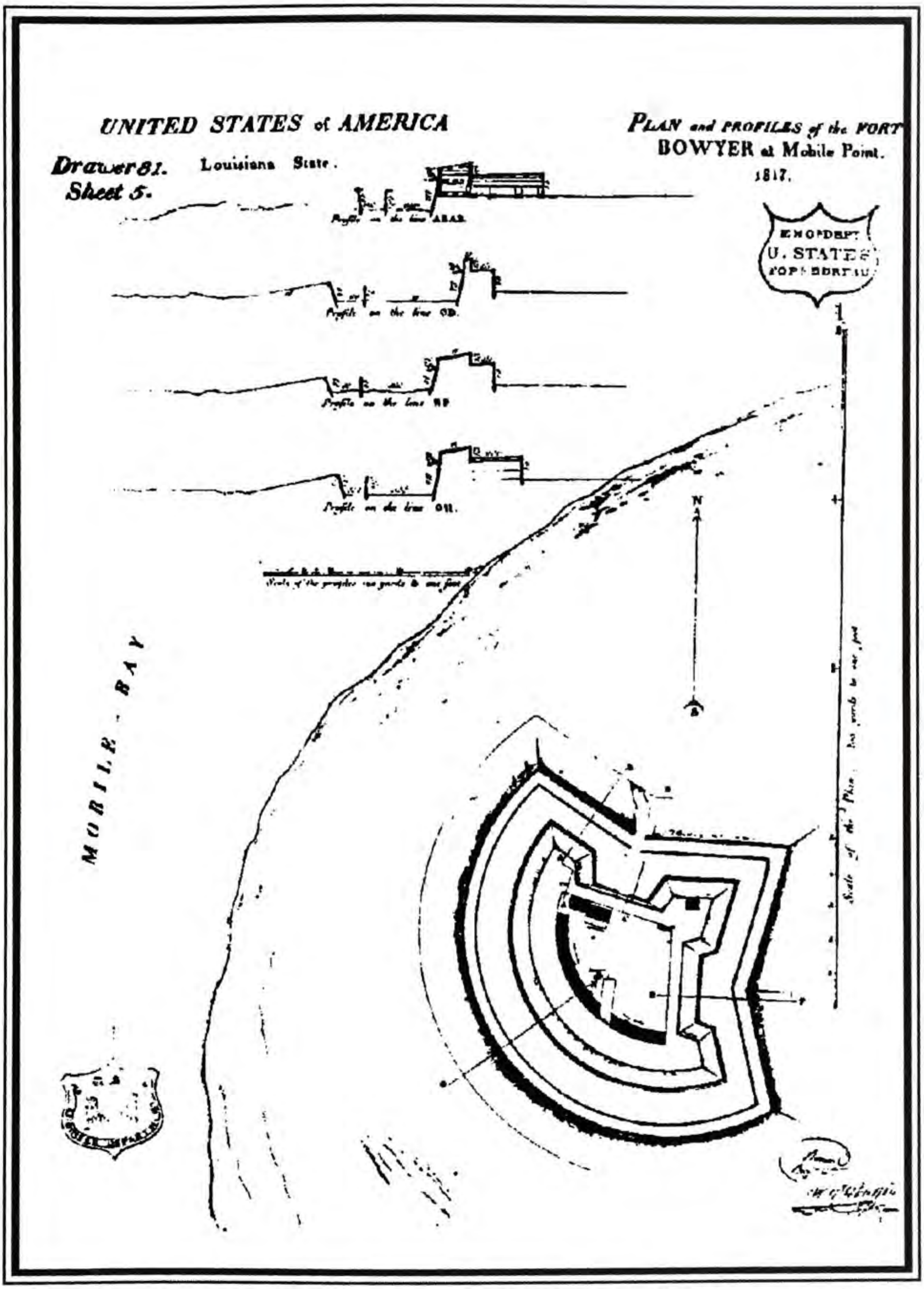


Figure 1-2. Plan and profile of Fort Bower at Mobile Point, 1817 (National Archives).

Although Gadsden's surveys (particularly his thorough assessment of the Gulf frontier fortification) were carried out in a professional manner, his reports to General Swift were quasi-personal in nature. The reports of Bernard and Gadsden, however, really had different focuses. Gadsden's orders called for a general reconnaissance of the current fortification situation and comments on how the existing forts might be improved. Bernard's report was based on the same general reconnaissance as Gadsden's, but also included a detailed program for the development of a fortification system along the entire Gulf frontier. The two reports were submitted within a few weeks of one another; the resulting correspondence and reports to the Chief of Engineers indicate that Bernard's was viewed as the "official" report.

Macomb ordered the Board of Engineers to proceed to the Rigolets at the entrance to Lake Pontchartrain and from there to Mobile Bay, thoroughly examining the state of construction in progress at those locations. Congress had authorized minimal funding for construction of a fort on Dauphin Island. It remained skeptical of the need, however, and discontinued funding of additional work until the site was reinvestigated and further justified by the Corps of Engineers. President James Monroe disagreed with Congress about the Dauphin Island project and sought ways to resume work on the forts at Mobile Point and on Dauphin Island. The Board of Engineers was therefore instructed to justify the construction of both forts.

After completing its report of fortification conditions west of Mobile Bay, the board conducted a reconnaissance of the frontier from Mobile Bay to St. Marks, Florida, and reported on its defenses. The report proposed Pensacola Bay as the site for a naval depot. (The site's commercial and geographical advantages had been reported on earlier). The Navy also had conducted surveys of the Pensacola area and was favorably impressed. The Board of Engineers was instructed to inspect Pensacola Bay, report on its potential as a permanent naval depot, and determine the practicability of defending such a depot with suitable military establishments on shore.[17]

The Defense System

The Board of Engineers for Fortifications, at the request of Congress, submitted a number of detailed reports on a proposed national defense system to the Chief of Engineers. Although a coastal defense system had not been formally adopted by 1821, the Board of Engineers had developed a rationale for accomplishing one that became a standard segment of the numerous fortification reports submitted to Congress.

A seaboard defense system would include four classes: a navy, fortifications, interior communications by land and water, and a regular army and well organized militia.[18] A navy had to be provided with proper facilities for repair, harbors for rendezvous, ports of refuge, and supply stations. Mobile Bay was deemed an especially important station and port of refuge for merchant and naval vessels. Fortifications had to be erected to protect the naval aspects and to guard the frontier. The forts at the mouth of Mobile Bay would accomplish several strategic objectives: 1) protect the bay, the watershed of the Tombigbee Alabama Rivers and the routes proposed to connect them with the Tennessee; 2) protect the communication between Mobile Bay and Lake Pontchartrain via the barrier island channel; and 3) deprive the enemy of a station from which to act against either New Orleans or any future establishments at Pensacola. Interior communication by land and water would be the basis for supply and troop support for the forts and would be accomplished via a national system of roads and canals. The army and militia constituted the vital link to the success of the entire system.[19]

The Board of Engineers' reports to Congress explained how forts were distributed into three classes based on the strategic importance of each fort. First-class forts would be erected initially. The forts at Mobile Point and on Dauphin Island were designated as second-class forts, were already under construction, and were given preference over the first-class forts projected for Bayou Bienvenue and Fort St. Philip for the defense of New Orleans. The two Alabama forts were larger and it was considered prudent to continue their construction before building smaller forts near New Orleans (forts that could be built rapidly if necessary).[20] Bernard stressed the importance of the Mobile Bay defenses and placed their cost at five times that of the five first-class forts recommended to protect New Orleans and the Mississippi River.[21]

The board's report also sought the adoption of a system designed to protect the Navy. In the early nineteenth century, the world's great military powers were those with sophisticated navies; this observation was not lost on the Federal government. Bernard's statement underscored the young nation's vulnerability to naval attack:

> . . .if we suppose that there exists no object on that frontier worth the trouble and expense of a great expedition, these fortifications will even yet be highly necessary; for we still have one great object to attain the security of our navy. [22]

Navy reports about the navigability of Gulf harbors, however, conflicted with engineer reports. Congress had questioned the need for Mobile defenses, which would require large expenditures for fortifications to protect a bay so shallow the Navy felt no large naval vessels could use it anyway.[23]

Congress was unmoved by the lengthy report submitted by the Board of Engineers for Fortifications. Bernard remained firmly committed to the proposed defense system. President Monroe continued to support the board's position and wrote to Congress to protest the withdrawal of funding.[24]

Other important points emerged from the board's reassessment of the Mobile Bay forts. The United States' acquisition of Florida in 1821 presented a new tactical problem. As stated earlier the Navy was interested in Pensacola as a site for a major naval depot on the Gulf frontier. The Corps of Engineers felt that without protection from forts at the mouth of Mobile Bay, Mobile could be taken easily by enemy forces and then used as a base to secure the fall of Pensacola. The Engineer board and President Monroe both were concerned that an unprotected Mobile Bay left the expanding Union especially vulnerable to military attack: lack of protection could result in commercial disaster as well.

Bernard also recognized the strategic importance of rivers flowing into the Gulf of Mexico. These rivers extended deep into the U.S. interior and could be cut off if an enemy got control of access. The connection of the Tennessee River basin with the Gulf of Mexico was a major concern in early 1821. Bernard pointed out that the Tennessee connection "will hereafter take place through Mobile Bay by artificial canals." Failure to adequately protect the bay would compromise the intended plans.[25]

A strong coastal fortification system would confine major conflicts to the high seas, and in turn minimize loss of life and military tangibles. Coastal industrial development also would be spared. A fortified coastline would offer safe refuge for American shipping and commercial ventures while protecting the agricultural activities vital to the survival of the people and the nation. The Board of Engineers for Fortification's was steadfast in its support of the system and never wavered from its assessment of the need.

Southern Live Oaking

The Board of Engineers' emphasis on the importance of the Navy as the first line of defense was important in the early history of the Gulf frontier. The Federal government had sought a strong Navy in the Gulf of Mexico in part because the area was a major source of live oak, the best wood for building ships. Live oaking, the process of selecting and cutting live oak trees for dimensional timber, flourished in West Florida as early as the 1770s; the industry attracted as much illegal trafficking as legal production.[26] British acquisition of Mobile was a source of consternation to France because the coast abounded in enough live oak, cedar, and other timber to outfit most of France's navy. As early as the end of the American Revolution, American military leaders recognized that large stands of timber were vital to naval development. Several decades, however, elapsed before appropriations were made for naval construction.[27]

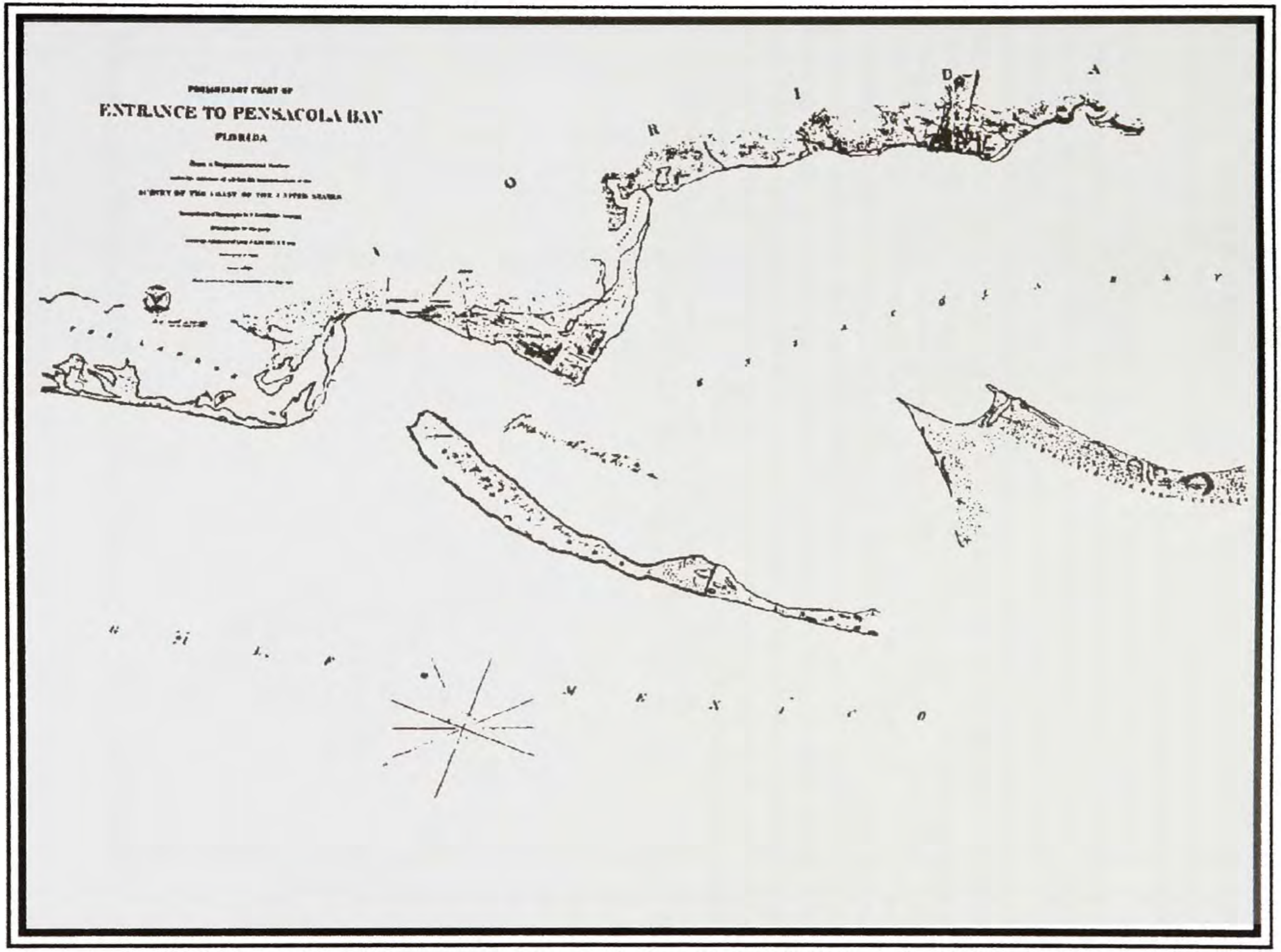
The War of 1812 prompted the Federal government to reassess its seacoast fortification system. While the Corps had primary responsibility for such an assessment, the Navy was involved as well. The Secretary of the Navy pleaded with Congress to fund timber surveys, because stands of ship timber were a primary requisite for selecting a naval depot site.[28]

Timber resources continued to be a vital concern until the Civil War, but the most intense interest was evident between 1820 and 1830. Congress funded a major survey in 1818 and 1819 that would encompass a detailed search of the Gulf coast from southern Louisiana to Mobile Bay and throughout the coast's hinterland.[29] John Landreth, James Leander Cathcart, and James Hutton were the Navy surveyors.[30] The surveys established that Pensacola was one of the most important source areas for ship timber, and a number of congressional acts were passed to protect the timber for use by the government. Illegal live oaking was a serious problem, compounded by poor accessibility throughout the region. Eventually, a live oak plantation was established on Santa Rosa Island, opposite the naval depot at Pensacola. This was considered an optimum location for easy removal of the timber (Map 1-1). [31]

The United States had a virtual monopoly on the world's live oak supply, and most of it was publicly owned as early as 1831.[32] Although the U.S. Live Oak Plantation on Santa Rosa Island was managed and protected by the Corps, it ultimately failed because of lack of funding and political leaders' indifference to its maritime value. The shift from wood to metal ships also eclipsed the need for timber in large quantities.

The Fortification of Pensacola

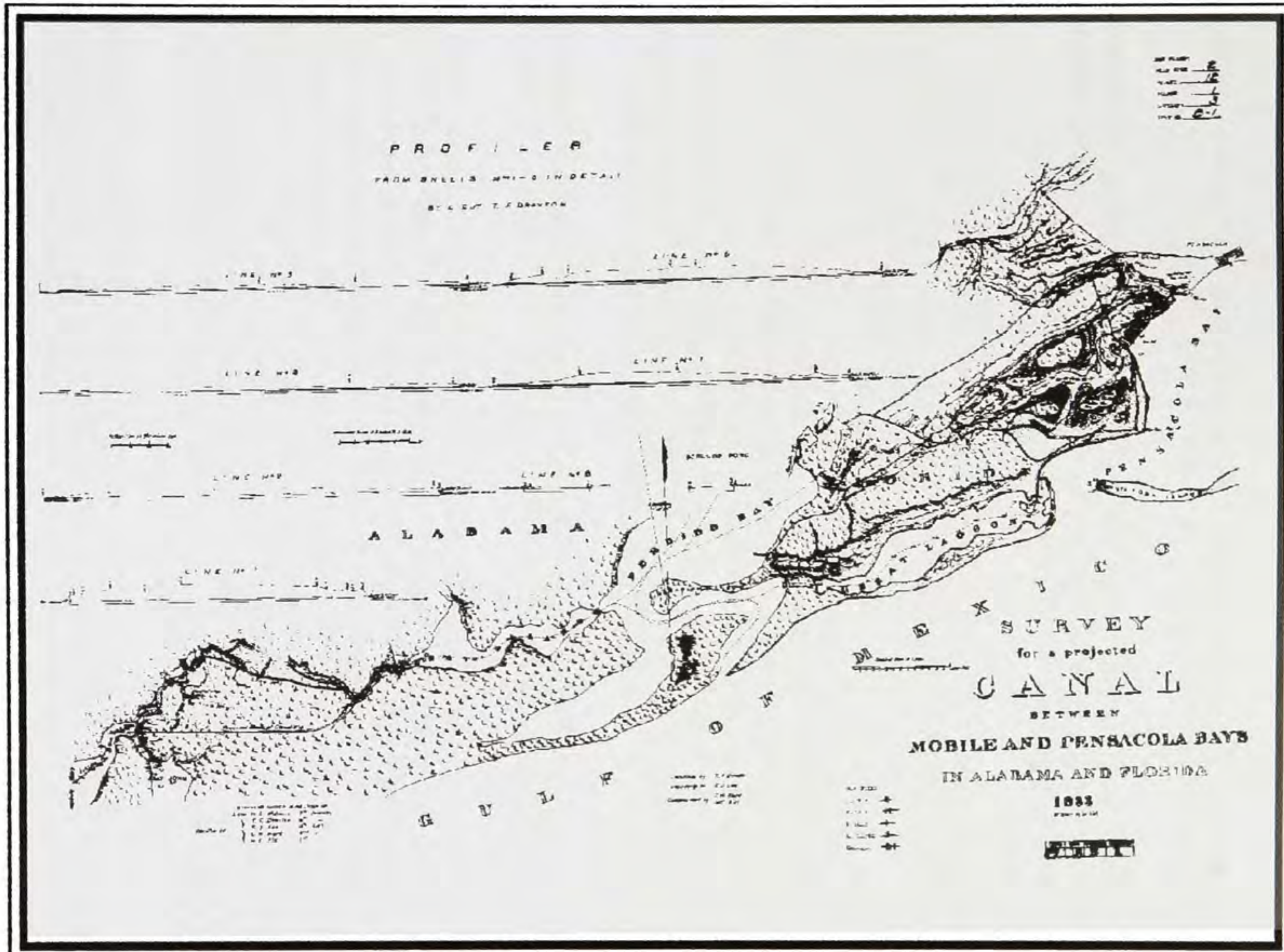
Following the joint efforts of the Navy and the Corps of Engineers, Pensacola was selected as a naval depot by a Senate resolution of 13 February 1817. Pensacola's selection as the major naval depot for the Gulf coast was finalized by 1825. The Board of Engineers



Map 1-1. Preliminary chart of the entrance to Pensacola Bay, Florida 1839. Note the US Live Oak Plantation on Santa Rosa Island (National Archives).

recommended a two pronged defense system, one part to defend the entrance to the bay and a second to protect land access to the naval depot. Pensacola lacked the geographic advantages for protection characteristic of such major Atlantic coast naval depots as Charlestown, Massachusetts and Burwell Bay, Virginia.

In addition to recommending a system of detached forts, the Board further recommended connecting Pensacola with New Orleans via a system of natural and man-made canals. The system would offer commercial and military advantages, but the first priority was to ensure the movement of supplies from New Orleans to Pensacola during wartime.[33] The project called for a sloop canal connecting the Mississippi River and Lake Pontchartrain. Boats would navigate between the Mississippi River and Mobile Bay via the Mississippi Sound. An additional small canal would connect Mobile and Pensacola Bay's (see Map 1-2).[34] The Pensacola defense system remained a topic of debate among the Chief of Engineers, the Board of Engineers, the Secretary of War, and Congress until 1828. The Corps recommended a large fort on the western side of Santa Rosa Island to protect the entrance to the bay; a smaller fort was recommended for the western side of the bay's entrance and opposite the Santa Rosa fort. Pensacola Bay's strategic importance was further attested to by the petition to have the main arsenal for the Gulf of Mexico located near the naval depot. At the time, the nearest arsenals were in Baton Rouge, Louisiana (250 miles to the west), and in Augusta, Georgia (500 miles to the northeast).[35] An 1832 petition resulted in the main arsenal being located on the Apalachicola River; a smaller arsenal had been built in the interim at Mount Vernon, Alabama, on the west bank of the Mobile River.[36]



Map 1-2. Survey for a projected canal between Mobile and Pensacola Bays in Alabama and Florida, 1833 (National Archives).

The Gulf Frontier: Notes

1 Jacques-Donat Casanova and Armour Landry, *America's French Heritage* (Quebec: La Documentation Francaise and the Quebec Official Publisher, 1976), pp. 148-149.

2 Walter Prichard, Fred B. Kniffen, and Clair A. Brown, "Southern Louisiana and Southern Alabama in 1819: The Journal of James Leander Cathcart," *Louisiana Historical Quarterly,* 28 (July 1945): 735.

3 Ibid., p. 852.

4 William Bartram, "A Trip Up the Altamaha River," in John Conron, ed., *The American Landscape: A Critical Anthology of Prose and Poetry* (New York: Oxford University Press, 1973), pp. 147 148. Forests were important in the early history of the Mobile District because of a joint effort by the Board of Naval Commissioners and the Board of Engineers, through the War Department, to survey and report the extent of timber available for use by the government. During the nation's early history, timber was vitally important for building in general, for industry in the production of charcoal, and for development of a dependable Navy. Naval stores (tar and resin) came principally from southern forests, and the demand for cedar and live oak grew steadily. For a discussion of the value of Southern forests, see Ralph H. Brown, *Historical Geography of the United States* (New York: Harcourt, Brace & World, Inc., 1948), pp. 109 110.

5 National Archives, Record Group 77, Entry 128, Orders of the Engineer Department; the U.S. Military Academy, and the War Department, 1811 74, pp. 3 4. Hereafter cited as RG 77.

6 Considerable correspondence between Lieutenant Dumas, the various Chiefs of Engineers, and other officers has been retained pertaining to Dumas' personal conduct. In a letter dated 1 October 1816, Swift cited Lieutenant James Gadsden as the officer in charge of the first survey and went on to say that Dumas would submit willingly to Gadsden's authority (RG 77, Entry No. 128, Orders of the Engineer Department, p. 8.). Dumas' career deteriorated rapidly. In a 3 July 1818 letter, Swift took further action and refused to reimburse Dumas for $1,000 in expenses until such time as "you have an opportunity to clear up the reports which have been officially made to this department in relation to your conduct as an agent" (RG 77, Entry No. 6, Letters Sent to Engineer Officers (1812-1869), p. 20).

Dumas was ordered by letter to prepare a defense and report to Washington immediately. This letter apparently was misdirected because Swift sent a duplicate via Nathaniel Cox, the agent for fortifications at New Orleans (RG 77, Entry No. 6, p. 29). On 12 November 1818, Swift sent yet another inquiry concerning Dumas's failure to report to Washington as ordered. In a letter to Cox, Swift questioned whether his letter had been delivered; its delivery had been considered a service to the government and he wanted to know what had been done with it (RG 77, Entry No. 6, p. 37). Dumas eventually defended himself before the Chief of Engineers, as letters to Cox and Captain Gadsden in February and March 1819 indicate. Dumas' subordinate to Gadsden was reaffirmed by the Chief of Engineers. In addition, Cox was authorized to investigate Dumas' expenses and to pay them if legitimate. Gadsden was instructed that "...Should you find his [Dumas's] conduct so improper as to justify a military examination, you will arrest him. Use your own judgement of propriety." (RG 77, Entry No. 6 p. 52)

On 25 August 1820 Dumas was reassigned by to Lieutenant Colonel Charles Gratiot at Hampton Roads, Virginia (RG 77, Entry No. 6, p. 146). Dumas continued to have trouble with his superior officers. The new Chief of Engineers, General Alexander Macomb, denied him an inquiry into charges filed against him. About one month later, in a letter dated 25 February 1822, General Macomb sent Dumas an explanation of why he had been passed over for promotion. The most damning evidence against Dumas came in an anonymous letter of 27 June 1822 that was sent to the Secretary of War. In the letter, he was accused of disgraceful conduct for publicly having an affair with a slave woman, then paying for her freedom and setting her up in a house (RG 77, Entry No. 20, Letters and Papers Received (Irregular Series), 1789-1831, Item 117).

In a letter of 28 June 1824 from the Chief of Engineers to John C. Calhoun, Secretary of War, all of the events relating to Lieutenant (now Captain) Dumas were summarized, with a recommendation that he be allowed resign or that he be dismissed for incompetency (RG 77, Entry No. 20, Item 166). Dumas resigned shortly thereafter.

7 The following letter from "a friend of the Army" to Secretary of War John C. Calhoun apparently sealed the fate of Captain Dumas. The letter was sent on 27 June 1822 from Brown's Hotel in Washington, D.C.

> "Capt. Dumas of the Corps of Engineers has boarded in this house for several months past, during which period he has conducted himself in a manner which evinces a great degree of moral turpitude. He has had almost an open intercourse with a servant (slave) of the house - Sojourners here have seen him frequently conducting her to his rooms and indeed so notorious has been his conduct that it would have been impossible for a person to have resided one week in the house without overhearing the servants [word illegible] vent on his conduct - and to crown all he has purchased the servant in question and furnished a house for her. A passing stranger who feels for the honor of the Army has made a plain statement of fact - and he thinks proper to remark that he is not personally acquainted with the officer whose conduct he implicated. But he has stated facts which are known to every person in the house and which he thinks it his duty to communicate to you."

8 RG 77, Entry No. 128, Orders of the Engineer Department, the U.S. Military Academy, and the War Department, 1811-74, p. 5.

9 Ibid.

10 Ibid., p. 8.

11 Virgil S. Davis, *A History of the Mobile District, U.S. Army Corps of Engineers, 1815 to 1971*, (Mobile, AL: U.S. Army Engineer District, 1975). Hereafter cited as Mobile District History.

12 Forest G. Hill, *Roads, Railways, & Waterways: The Army Engineers and Early Transportation* (Norman: University of Oklahoma Press, 1957), pp. 6 9. The attempt to gloss over the appointment of a foreigner to a position of authority equal to that of

the Chief of Engineers ran into immediate opposition. General Swift felt foreign engineers were suitable only for military instruction and should be assigned to the academy at West Point. Swift also felt that Bernard's appointment was an insult to American engineers and that the appointment undermined the very reason the Corps of Engineers had been formed: to eliminate the country's dependence on foreign engineers for advice. Because of his opposition, Swift was assigned to West Point, effectively removing him from control of the newly created Board of Engineers for Fortifications. Neither Col. Totten nor Col. McRee were happy with the assignment. In November 1818 Swift resigned in protest and in 1819 Col. McRee did likewise. Col. Totten continued to serve with distinction on the Engineer Board. Working and traveling extensively with Bernard, Totten continued to doubt Bernard's usefulness to the government. Bernard eventually resigned from the board and returned to his native France.

13 RG 77, Entry No. 20, Box 9, Folder 101 76 95(G) 1789 1831, Item No. 79.

14 RG 77, Entry No. 221, Reports, War Department, Corps of Engineers, Reports on Fortifications and Topographical Surveys, 3 July 1812 to 4 October 1823, pp. 179ff., 208-269.

15 Ibid., p. 186.

16 Ibid., pp. 208 269.

17 RG 77, Entry No. 127, Engineer Orders and Circulars, p. 82.

18 U.S., Congress, House, Committee on Military Affairs, *Permanent Fortifications and Sea-Coast Defences,* H. Rept. 86, 37th Cong., 2d sess., 1862, pp. 25 26; *American State Papers, Military Affairs,* Vol. 2, No. 206. Hereafter cited as ASP MA.

19 ASP-MA, Vol. 2, No. 206, p. 305ff.

20 Ibid., pp. 304 305.

21 Ibid., p. 311.

22 Ibid., p. 309.

23 ASP-MA, Vol. 2, Item No. 214, "Fortifications for the Protection of Mobile," 1822, pp. 345-348.

24 ASP-MA, Vol. 2, Item No. 223, "Re-examination of the Positions on Dauphin Island and Mobile Point for Fortifications," 1822, pp. 368-370.

25 ASP-MA, Vol. 2, Item No. 214, "Fortifications for the Protection of Mobile," 1822, p. 348.

26 Virginia Steele Wood, *Live Oaking: Southern Timber for Tall Ships* (Boston, MA: Northeastern University Press, 1981), p. 14. Hereafter cited as *Live Oaking.*

27 Ibid., p. 16.

28 *American State Papers, Naval Affairs,* Vol.1, Entry No. 156, "Defence of the Maritime Frontier and Establishment of Naval Depots and Dockyards," 1818, p. 487. Hereafter cited as ASP-NA

29 John Landreth, *The Journal of John Landreth, Surveyor to the Agency of James L. Cathcart and James Hutton Esquire Agents, for Selecting any Unappropriated Lands of the United States as may be found to produce Live Oak and Red cedar Timbers*

Suitable for Naval Purposes, commenced in 1818 and ended in 1819. Edited by Milton B. Newton, Jr., Baton Rouge, LA: Geoscience Publications, 1985. This is a detailed account of one surveyor who spent much time traversing portions of the Gulf coast that became part of the Mobile District. It is a vivid account of the intense but fleeting government interest in southern live oaking.

30 Ibid., p. ix.

31 *Live Oaking,* p. 50.

32 Ibid., p. 54.

33 ASP-MA, Vol. 3, Item No. 287, "Fortification of the Harbor of Pensacola," 1825, pp. 158 159.

34 Ibid., p. 159

35 ASP-MA, Vol. 3, Item No. 366, "On the Establishment of an Arsenal at Pensacola, Florida," 1828, pp. 681 684.

36 ASP-MA, Vol. 4, Item No. 503, "On the Expediency of Establishing Arsenals in Alabama and Florida," 1832, p. 829.

II. The Seacoast Defenses, 1815 - 1861

The Corps' preliminary and follow up surveys of the Gulf frontier resulted in a string of fortifications along the southern coast from the mouth of Lake Pontchartrain in the west to the mouth of the St. Marks River in Florida. Although forts were key elements in the defense system, complementary structures such as light-houses and towers were also built. Fort Gaines and Fort Morgan at the entrance to Mobile Bay, and Fort Pickens and Fort McRee at the entrance to Pensacola Bay typify the state of military technology and funds expended to create a viable seacoast defense system. They also symbolize the Corps' resolve in fulfilling a mission assigned to them by Congress. Both of these strategic coastal areas eventually became part of the Mobile District.

Objectives of the Permanent Fortification System

The general fortification system proposed by the Board of Engineers was national in scope. In determining the best system, General Bernard and other board members considered the geography of the nation, the overall military organization, and the state of the art of military architecture.[1] The premise was that each factor was integral to the functioning of the whole.

The fortification system was divided into three classes of structures. First-class forts were designed to protect important cities, naval depots, arsenals, or any other site considered vital to the nation's survival. Second-class forts would protect cities or sites considered important but less vital. Third-class forts were those considered necessary to round out the system, but that could be delayed until more strategic forts were completed. The classification system was flexible in allowing forts to be shifted between categories if their strategic importance increased or decreased. It also allowed for exceptions to the system as to construction priorities if the Board of Engineers so determined.

Fortifications in the immediate vicinity of New Orleans were classified as first-class, although the second-class forts protecting Mobile Bay received greater attention and support than those for the Mississippi delta. Later, as the naval importance of Mobile and Pensacola evolved, some forts classified as second-class in the initial proposals were upgraded to first-class projects.

Construction costs for the forts along the Gulf coast were expected to exceed $17 million, a massive outlay for the period.[2] Nonetheless, the system was intended to be permanent and the costs involved were expected to yield benefits for decades to come. The proposed federal expenditure was justified by tying the construction to the future prosperity of the expanding nation. The analytical technique adopted in the 1820s to underscore the need for a seacoast defense system is still used by the military to justify contemporary defense expenditures.

Congress set about appropriating funds to accomplish the goal set forth by the Board of Engineers. However, the system designed to be constructed simultaneously ended up being construct-ed piecemeal. Fort design lacked national coordination; each structure was designed individually, often with the help of engineer officers.

Bernard's considerable experience and expertise were reflected in the forts constructed on the Gulf frontier. Each was designed to contain artillery, garrisons, and magazines sufficient to repel an enemy fleet, and to resist open land assaults and limited sieges. His designs included further protection in the form of vaulted bombproofs covered with massive amounts of earth intended to shelter troops, safeguard the magazine, and secure some of the armaments. In addition, a considerable portion of the large artillery was mounted *en barbette*.[3]

The most important engineer of early modern Europe was Sebastien de Vauban (1633 1707).[4] His designs were so successful that generations of military engineers used them as the basis for developing fortification systems.[5]

Vauban's basic design separated the bastions from the main work. Ditches were constructed in front of the bastions as well as between the bastions and main work. His basic idea was modified later by adding out-works. Some of the forts constructed as part of the American sea-coast defense system, such as Fort Morgan at Mobile Point, were patterned after Vauban's designs.[6]

The more innovative Americans made technological contributions, especially in armaments. Nonetheless, American military engineering continued to be strongly influenced by the Europeans, especially the French. For example, the French engineer Montalembert reintroduced casemates into harbor fortification.[7] While casemates increased protection from enemy fire, they were even more important because a fort's armaments could be stacked, like guns on the decks of a warship. Despite the advantage casemates offered for developing tiers of cannons, the use of casemates for the Gulf forts was restricted by geology. The soil simply could not support the weight. The use of casemates for a single level, however, became standard.

The permanent American fort system, including forts built after the War of 1812, was referred to as the Third System.[8] The Third System was significant because it was the first permanent system, was nationally planned, and affected fortification construction and placement for the next century. First System forts were those constructed prior to the American Revolution, while Second System fortifications consisted of small batteries built prior to the War of 1812. The Board of Engineers for Fortifications, under the charge of Bernard but ably assisted by Colonel Joseph G. Totten, coordinated work on the Third System forts. The board continued in one form or another from 1816 until the beginning of World War II.

The forts designed by the board attracted worldwide attention. They represented the ultimate design for structural durability, concentration of armaments, and enormous overall firepower.[9] These attributes, which had existed only in scattered locations, become integral to the new national system of defense.

Along with the new design of the Third System forts came innovations in armaments. General Totten, a brilliant engineer who later served with distinction as Chief of Engineers, was a leader in the science of armament research. He is best known for experimenting with and refining the casemate. Totten also experimented with embrasure openings, swivel ranges of cannon, and metal armor as a shield material; the Totten embrasure was named after him.

Most of the Third System forts were polygonal in design, with variations in the number of sides, or faces. Fort perimeters varied considerably, depending on the magnitude of the protection required. The Gulf forts, for example, tended to be larger than most of those on the Atlantic coast because they were considered "isolated" positions vulnerable to siege. The larger size added potential sustaining capability when under siege.

Work at Fort Gaines commenced in 1818 but was discontinued in 1821. Construction resumed years later, but by then Bernard's original design had been altered substantially. While slightly larger and stronger, Fort Morgan's design was similar to that of Fort Jackson, Louisiana (see Figure 2-1). Fort Morgan had a classic design with no obstructions around it. Each of its sloping earth planes was protected with a masonry work. The glacis that protected the scarp terminated against the brick parapet wall of the covered-way banquette, and behind this rose the exterior slope of the ramparts.[10]

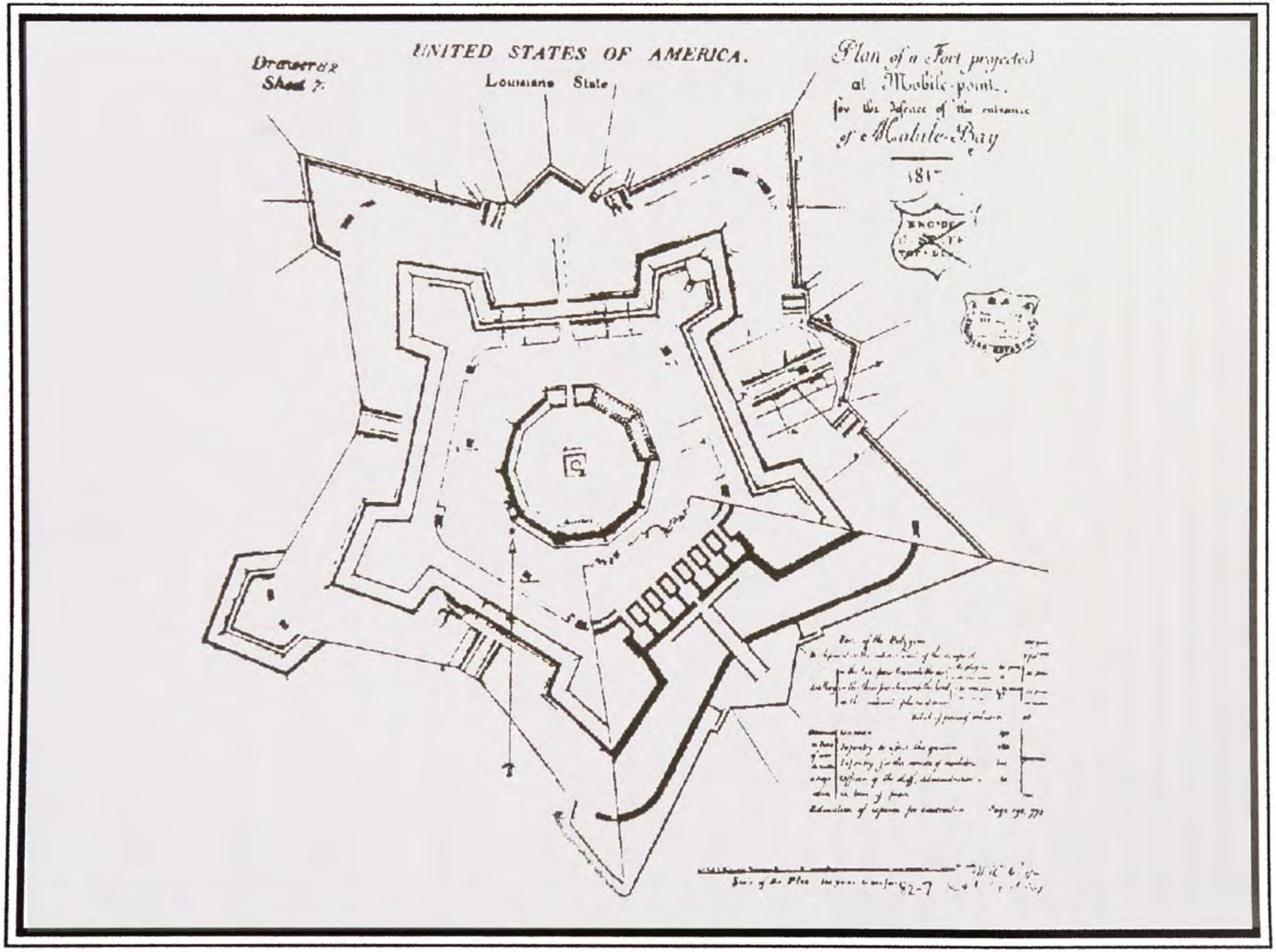


Figure 2-1. Plan for a fort at Mobile Point, 1817 (National Archives).

Fort Pickens, on Santa Rosa Island at the mouth of Pensacola Bay, was also a French design. The area was reconnoitered in 1821 and a site was chosen, but construction did not begin until 1828. For its time, Fort Pickens was the largest and most complex military structure on the Gulf.[11]

By the time funds were appropriated to restart work on Fort Gaines, a new era of fortification engineering had begun. Although Vauban's influence on military engineering had waned, the European influence still prevailed.[12] The new plans for Fort Gaines reflected changes in American fort design, which included the use of the "Carnot wall," a rearrangement of the rampart wall. Former steep counterscarp walls were replaced by gentle slopes that allowed sorties against the enemy.

Fort Gaines' new design also deviated from Bernard's philosophy of function. By the 1840s, protection against sea and land attacks was considered separately. The placement of guns, and thus the basics of design, differed for each side of the fort.[13]

The Proposed Defenses

The Board of Engineers recognized the substantial differences between the frontier they were expected to defend on the Atlantic coast and conditions on the Gulf frontier. The board doubted that the southern frontier would be settled quickly, densely, or with people capable of defending themselves against a major attack.[14] The board saw the need for a particularly strong system "especially if we consider its comparative feebleness in connection [sic] with its comparative importance."[15]

Recommendations for Gulf forts were made again in 1826 as part of a revised report on fortifications requested by Congress. The importance of Pensacola Bay led the board to recommend a fort on the western extremity of Santa Rosa Island. Perdido Bay, situated between Pensacola Bay and Mobile Bay, was considered essential to the protection of both, hence a survey was requested. For Mobile Bay, the board recommended the construction of forts on Dauphin Island and Mobile Point. In addition, construction of a tower at Pass au Heron was proposed. By 1826 the fort at Mobile Point was under construction and had been upgraded from the second-class to first-class category. The fort was estimated to require a garrison of 85 soldiers during peacetime and 750 soldiers during siege. In addition, it would need 100 guns, of which 10 would be howitzers or mortars and would cost an estimated $539,000.[16]

Congress continued to withhold appropriations for the construction of a fort on Dauphin Island. The Board of Engineers, however, persisted in its efforts to secure funds, and continued to give annual estimates of construction costs, garrisoning, and armaments. No cost projections were made for the Pensacola defenses in 1826.

By 1836 the fort at Mobile Point was completed, the Santa Rosa Island works were nearly completed, and a secondary defense at the Barrancas was projected at a cost of $100,000. In the interim, costs estimated for construction of the Dauphin Island fort and the tower at Pass au Heron had skyrocketed. Originally, the tower at Pass au Heron was to cost $16,000 and the fort at Dauphin Island in excess of $500,000. By 1836, the estimate for these two works exceeded $900,000.[17]

First-class forts in progress in 1836 included Fort Pickens at Pensacola, which had a battery of 252 guns, an estimated peacetime garrison of 100 men, and a siege garrison of 1,260 troops. In addition, a fort was being constructed opposite Fort Pickens on Foster's Bank (later named Fort McRee) that would require 50 men during peacetime and 720 men during siege. The fort would use 144 guns and would require an outlay of $160,000.

The issue of seacoast fortification periodically surfaced in Congress throughout the antebellum period. The Secretary of War in 1840 reiterated the need for a national policy regarding seacoast fortifications.[18] Congress became interested once again because of a recommendation from Major General Edmund P. Gaines, Army commander in the west. Gaines suggested that the system of seacoast fortifications under construction be abandoned in favor of a system based on floating batteries and national foundries. Gaines' intent was to establish a national rail network for transporting troops and armaments. The Board of Engineers rejected the idea and Congress was made well aware of the Corps' position.

The Engineers stressed that the Gulf frontier was vitally important to the protection of nearly three fourths of the nation's territory. This premise was based on the fear that if the coast were invaded and held, then control of the watersheds of all of the major rivers flowing into the Gulf of Mexico would likewise fall. In such a scenario, "the evils which would result from the temporary occupation of the delta of the Mississippi, or from a successful blockade of the coast of the Gulf of Mexico, would not only injure the prosperity of these States, but would deeply affect the interests of the whole Union."[19]

In 1851, Lieutenant Colonel Rene E. De Russey reported that three of the major forts planned as part of the coastal defense system were complete: Fort Morgan on Mobile Point, and Fort Pickens on Santa Rosa Island and Fort McRee (also spelled McRae and McRee; referred to by Chase as Fort McKee) on Foster's Island, both at the mouth of Pensacola Bay. Fort Gaines, the complement to Fort Morgan on Mobile Point, had been reauthorized by Congress. De Russey felt that appropriations could be expended as soon as clear title was secured; this local problem often delayed construction.[20] Major William H. Chase, former field engineer in charge of the Gulf fortifications, assured Congress that the monies expended to date (1851) had provided the United States with "the best fortified sea coast in the world."[21]

Construction Problems

A number of problems arose in constructing fortifications on the Gulf frontier. The first engineers and contractors worked in wilderness conditions, a fact that letters to Congress corroborated. In fact, contractors building Fort Gaines on Dauphin Island sued the government for damages. Augustus Green, agent and clerk to the contractors, related that the "island is a complete wilderness, only one French family living on it,...The soil is very poor and sterile, entirely composed of sand."[22]

While all problems associated with construction of the fortifications were interrelated, six problem areas were common to all the projects:

- Supplies and materials
- Contracts
- Labor
- Climate
- Appropriations
- Communications

Securing authorization for supplemental structures was a minor but continuing irritant. Sometimes such needs were not foreseen in the planning process. For example an additional wharf might be needed for unloading supplies and materials, likewise a wagon road from a wharf to the fort site or a short rail line for movement of heavy armaments. Nothing, however, could be constructed without proper authorization which often never came.

Supplies and Materials

The southern frontier's sparse population, lack of roads, and generally weak communications infrastructure played havoc with fort construction. One of the first activities was determining the quantity, quality, and means of securing materials necessary to build the forts. Gadsden's early survey noted the difficulty in getting supplies into the area. Captain De Russey, who took command as Superintending Engineer on the Gulf frontier in 1821, inherited a problematic supply situation. The only public works projects progressing according to plan were at the Rigolets. Progress in building the defense system for Mobile Bay had been slowed by lack of materials and supplies, contract disputes, and sporadic congressional appropriations.

De Russey sent Lieutenant. H. C. Story to reconnoiter Fish River to ascertain the amount and quality of stone there.[23] Irregular beds of ferruginous sandstone had been reported that might be appropriate for construction needs. Similar sandstone had been used effectively to build the foundations and part of the superstructure of old Fort Charlotte in Mobile. If suitable quantities were available and could be quarried easily, the sandstone would be used for the dry foundations of the Mobile Bay defenses.

De Russey found that brick and timber were available in the immediate area, along with some usable stone. Additional stone sources were found later around Pensacola Bay and along the Perdido River. While stone was preferred, records indicate that brick became the major building material for the Gulf forts. However, because of the dearth of brickyards when Army engineers arrived on the frontier, procuring them was difficult. As a result, the first contracts negotiated were for brickyards to be built to supply construction materials.[24]

Because millions of bricks were needed their cost became a major budget item. The most vexing problem was delivery. The scarcity of vessels capable of carrying large tonnage resulted in exorbitant transportation costs. Within a few years, so many brickyards lay scattered between Pensacola and Mobile that the market was saturated. Superintending engineers periodically wrote to brickyard owners informing them that the government could not guarantee a market.

Special equipment or tools had to be ordered through New York, which caused long delays. The passage from the North often took several months. The slow receipt of plans for new construction and for modifications of existing structures was another problem.

Contracts

Contracts were let in mid 1818 for a fort to be built on Dauphin Island.[25] The related contract problems are representative of those associated with a number of later forts. The government's policy regarding drafting and negotiating public works contracts was not well defined in the early decades of the nineteenth century. This fact, along with poor communication and the long distances involved, precipitated a legal confrontation between the U.S. government and the contractors building the Dauphin Island fort.

By 1821, the Dauphin Island project was in serious trouble. Congress was reconsidering the need for such costly forts at the mouth of Mobile Bay when New Orleans was more important and still vulnerable. Complaints about unnecessary delays in the arrival of supplies and materials necessary for construction further prejudiced the lawmakers. Improper transfer of portions of the original contract, contractor insolvency, and disputes over ownership of materials were issues that had to be resolved by the U.S. Attorney General. The superintendent of fortifications was to ensure that nothing was removed from the fort site until all issues had been resolved.

The President decided in March 1821 to cut off funding for the project and "that it would rest with the contractors to progress with their own resources and redeem advances, etc....."[26] Litigation against the government for default on the contract was eventually resolved by Congress in favor of the contractors.[27]

De Russey was also handicapped by lack of guidance from Washington and by contractor insolvency. The death of a Colonel Hawkins added to the difficulties in resolving the contract situation at Fort Morgan. Efforts to collect on debts owed by Hawkins prevented de Russey from fulfilling orders to reconnoiter resources east of Mobile Point; he feared that in his absence, stored materials would be stolen to cover Hawkins' debts.[28]

Labor

At the outset, the plan was to bring white labor from the North at a reasonable cost to the government. However, climate and distance worked against enticing northern whites to accept employment along the Gulf frontier. Labor consisted primarily of slaves secured by contract from plantation owners in the immediate vicinity of the public works projects. Slaves were initially hired for an hourly rate, paid to the slave owner, but wages were eventually negotiated on an annual basis. An 1826 letter from Lt. C. A. Ogden stated that "6 to 8 negroes employed on the walls as masons...have laid brick not only more faithfully than white men would, but more in a day than white men could during the summer, and have by that means kept the latter continually on the face of the walls."[29] Some skilled labor, such as carpenters or masons, had to be imported from the North.

The daily log of operations at Fort Morgan for 1828 indicates the occupations and number of individuals involved. Labor figures fluctuated yearly according to appropriations, and seasonal labor tallies varied based on whether laborers were at the fort site or scattered around the area making bricks or securing other materials. (Detailed information was recorded only for work at the fort site). The labor roster lists a Superintendent of Engineers, Assistant Engineer, surgeon, principal overseer, clerk, storekeeper, coxswain, baker, carpenters, blacksmiths, masons, and laborers.[30] Some occupations included subcategories such as master mason, mason, laborer mason, and attending laborers. During construction peaks, 175 to 225 people generally were working.

The officers and overseers superintended. Other jobs included working on casemate arches, brick molding and repair, gateway arch brickwork, and outhouses for officer quarters; providing public transport; receiving materials; baking and cooking; mending and repairing tools; making lime; preparing clay, and lumber; transporting bricks; and making lath.[31]

Labor difficulties most often occurred over wage disputes affecting skilled or semi skilled labor, although an occasional dispute arose over the hiring of slaves. When work was suspended for lack of funds, laborers often migrated to Mobile or New Orleans seeking employment. Getting the labor force to return when new appropriations were authorized often involved the renegotiation of wages; labor costs tended to be high because the Superintending Engineer was not in a strong bargaining position. Labor was an ongoing problem over the several decades of Gulf forts construction.

Climate

A negative perception about the southern climate existed by the time Army Engineers were assigned to the Gulf frontier. The general feeling was that the climate was debilitating at a minimum and fatal in the extreme. The public and the professional community in the early nineteenth century understood little about the effects of environmental conditions or disease. Malaria, yellow fever, and typhoid beset every community; bloodsucking insects, high humidity, and violent weather were ever present.

Superintending Engineers were rotated for reasons of health; one wrote to the Chief of Engineers that work had been delayed while he was ill with the "bilious fever." De Russey eventually was transferred to a post in New York Harbor for health reasons although extended separation from his family was also a contributing factor.[32]

Upon arriving at Dauphin Island in 1818, Augustus Green, one of the subcontractors, commented in his journal about the unhealthy climate. Insects were so numerous that some northern laborers left without doing even an hour's work.[33]

Fever epidemics were a fact of life along the entire Gulf Coast into the twentieth century. Major Chauncey B. Reese, who opened the Engineer office in Mobile in 1870, died that same year from yellow fever.[34] Operation books for the various fort sites list laborers who died from fever. Captain William H. Chase, who was in charge of the fortification project at Santa Rosa Island, suffered from fever, as did others under his leadership. Chase was concerned about the exposure of Engineer officers to unhealthy conditions because of an already inadequate officer corps. Chase himself had survived 14 bouts of fever during his Gulf Coast posting, and he felt that no officer could serve more than four years without irreparable injury to his health.

Climate also affected operations throughout the Gulf frontier. Work on forts was seasonal; less activity took place in the spring, the "sickly season" when yellow fever was prevalent. In the summer and early fall, violent rain storms and hurricanes not only halted work, but sometimes destroyed that already completed.[35]

The subtropical nature of the environment meant that summers were humid and characterized by frequent, torrential rainfalls. Flooding of excavations was common. Rebuilding and extensive repairs increased costs and delayed completions. Wave action associated with the storms caused beach erosion, swamped supply vessels, or destroyed wharves. Periodically, devastating hurricanes caused extensive damage to the fortifications, officer quarters, and miscellaneous outbuildings at the construction site.

Many of the white laborers brought down from New York and New Jersey could not acclimate to the summer heat and humidity. The common belief was that blacks were inherently suited to heavy labor in such a climate because of their African origins. Monthly reports from the Superintending Engineers indicate that blacks did perform better, but were vulnerable as well to heat prostration and fevers.

Fortification plans at Mobile Point were modified at least once because of the heat. The height of the ceiling in the citadel, for example, was increased to improve air flow and a piazza was constructed around the inner yard to provide shelter from the sun. The strain of working long hours in the heat led to official permission for increased rations to sustain laborers throughout the long daylight hours. By contrast, the winter season was the best work period with mild temperatures and relatively dry conditions. Unfortunately, appropriations for work often were received too late for winter work.

Appropriations

The success of any project authorized by Congress depended on the regularity and amount of funding. Appropriations for seacoast defenses in general, and for Gulf coast forts in particular were erratic. Furthermore, rivalries then existing in Congress meant an uneven geographic distribution of appropriations. Appropriations for a fort in Virginia or New York, for example, were much more likely than for one in the sparsely inhabited coastal region of the South. In addition, only a portion of a project was usually funded. The result was that forts designed to be completed in two to three years often took six to eight.

The Corps developed a complex accounting system for monitoring funds, as attested by the daily accounts ledgers for Fort Morgan. Each officer in the field had to submit a monthly progress report on the various public work(s) assigned to him. Part of the report was a detailed general accounting for all expenditures. The accounts in turn were scrutinized by the Army's auditors. Corps' correspondence suggests that inattention to accounting was commonplace. Given the heavy responsibilities borne by the understaffed Engineer officer corps, the stringent stewardship and accountability was commendable. [36]

Communication

Communication between Washington and the Gulf coast was difficult during the early years of Corps activity. Letters, monthly reports, drawings, and plans for the forts, surveys, and other official correspondence were voluminous. A chief concern for the Engineer officer was that communication delays could threaten the execution of a designated responsibility. Issues constantly arose requiring input from the Chief of Engineers, usually in granting authority to alter an order or to begin necessary work not previously planned. In a letter to Chief of Engineers Armistead, De Russey revealed the frustration experienced by officers:

> The total ignorance in which I am left in relation to the views of the Government respecting the Fortifications to be erected at the entrance of Mobile Bay, together with the stagnation which prevails on the part of those who pretend to the right of continuing work....[37]

Much communication seems to have been misdirected, or ignored. Gadsden was hampered in carrying out his duties because plans sent from Washington never arrived.[38] Nevertheless, the frontier and headquarters did manage to maintain contact. Each officer had to arrange to send official correspondence by packet or, infrequently, by an assistant officer who might be passing through Washington on his way to a new assignment. When combined with contract disputes, labor problems, and scarcity of supplies, the challenge of maintaining contact with headquarters simply added to the sense of frustration felt by Engineer officers.

The Forts

Fort Gaines on Dauphin Island was the first fortification begun for the defense of Mobile. A contract was let in 1818 and work began in 1819. Within two years, however, the project was halted by lack of appropriations as Congress called for a reinvestigation and reassessment of the need for the fort. Construction of Fort Morgan, across the entrance of the bay on Mobile Point continued. Fort Gaines (Figure 2-2) was reauthorized for additional construction in 1846. Not until after 1850, however, did that actually begin. The delay involved a six year legal battle to regain clear title to the fort site. Appropriations were erratic and construction progressed slowly. In 1859 the fort was still incomplete; it was not finished until after it was occupied by Confederate troops. By the time the Confederates finished the fort, the South was unable to adequately arm it. Consequently, Fort Gaines failed to serve either side in the conflict.

Nevertheless, Fort Gaines exemplified the latest engineering technology. Bernard's original design was replaced by the most advanced fortification design for that time. Like Forts Sumter and Pulaski, it was a pentagonal structure that provided separate functions relative to land and sea defense. The fort's most distinctive feature was the use of the Carnot wall, named after the noted French engineer who designed the new type of fortification profile.[39] Carnot's plan called for the scarp to be moved away from the rampart, thereby creating what was believed to be a more stable rampart. Should an enemy breach the scarps, enemy bombardment would not bring down the earth of the ramparts and create a ramp

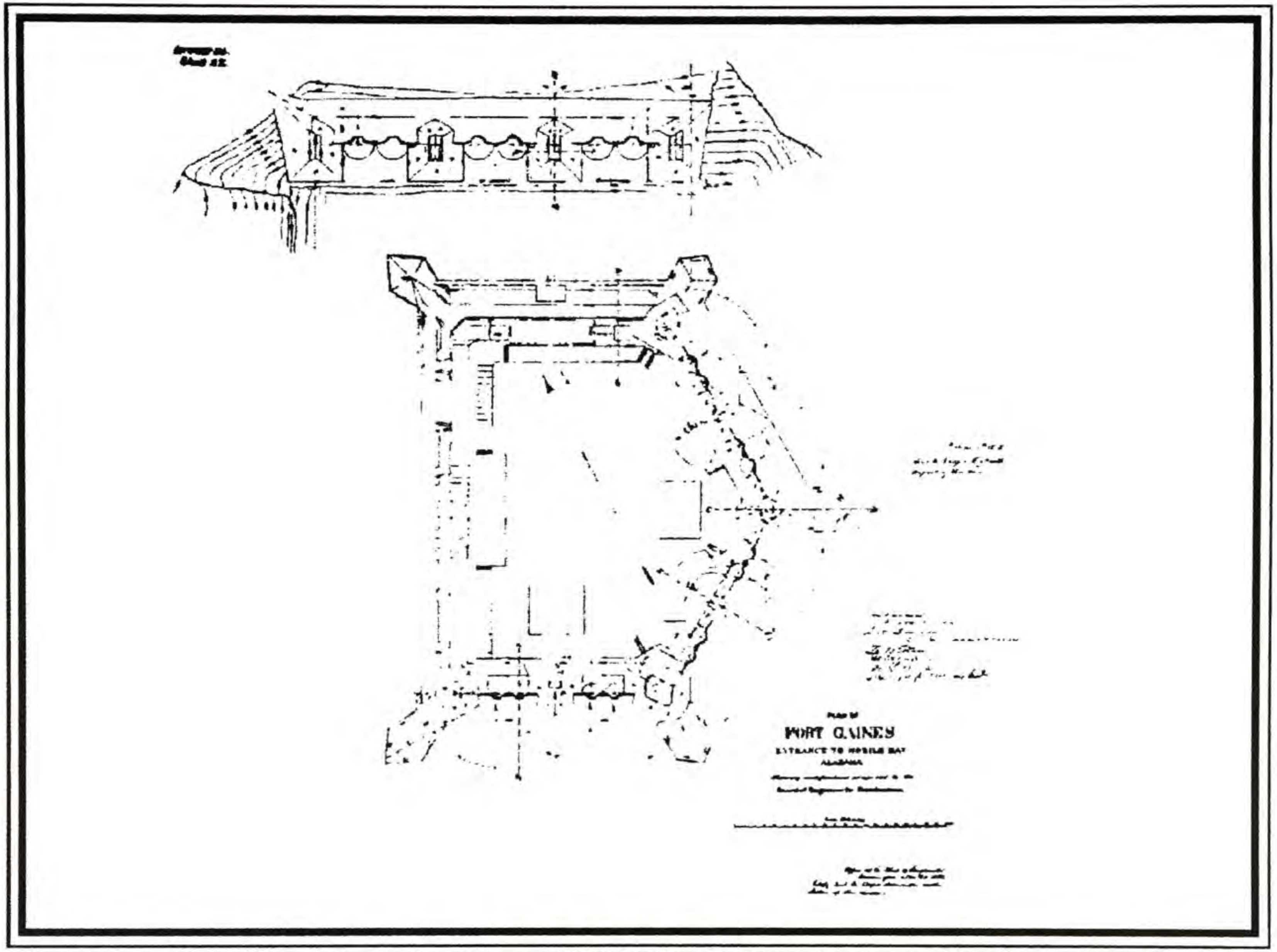


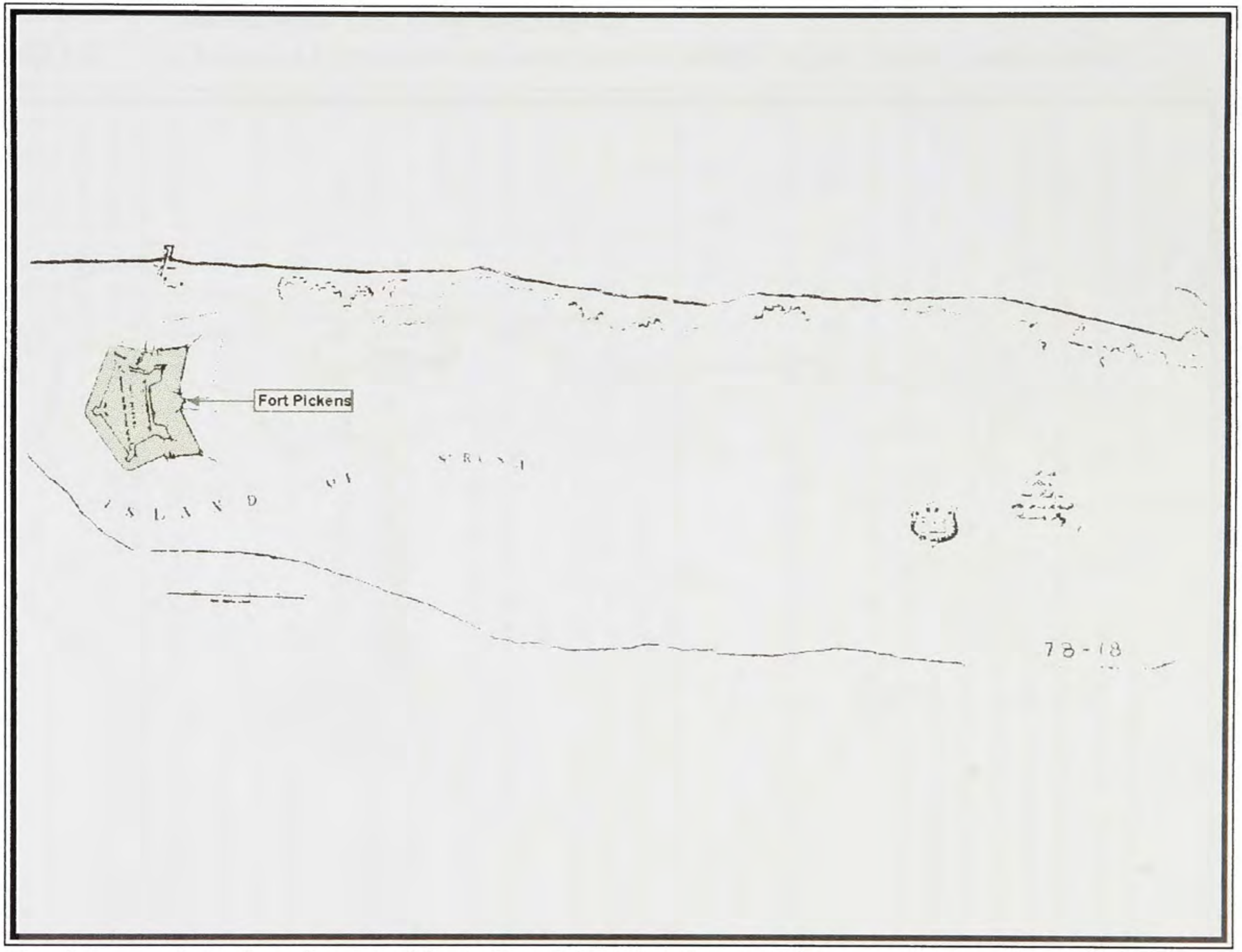
Figure 2-2. Plan of Fort Gaines at the entrance to Mobile Bay, Alabama showing modifications proposed by the Board of Engineers for Fortifications, no Date (National Archives).

enabling the enemy to storm the inner fort. Adjustments were made to the counterscarps and the armaments were rearranged as well. Carnot's design signaled the waning of Vauban's influence in fortification design and emphasized Totten's new philosophy, which was based on separate functions to protect against land and sea attack.[40]

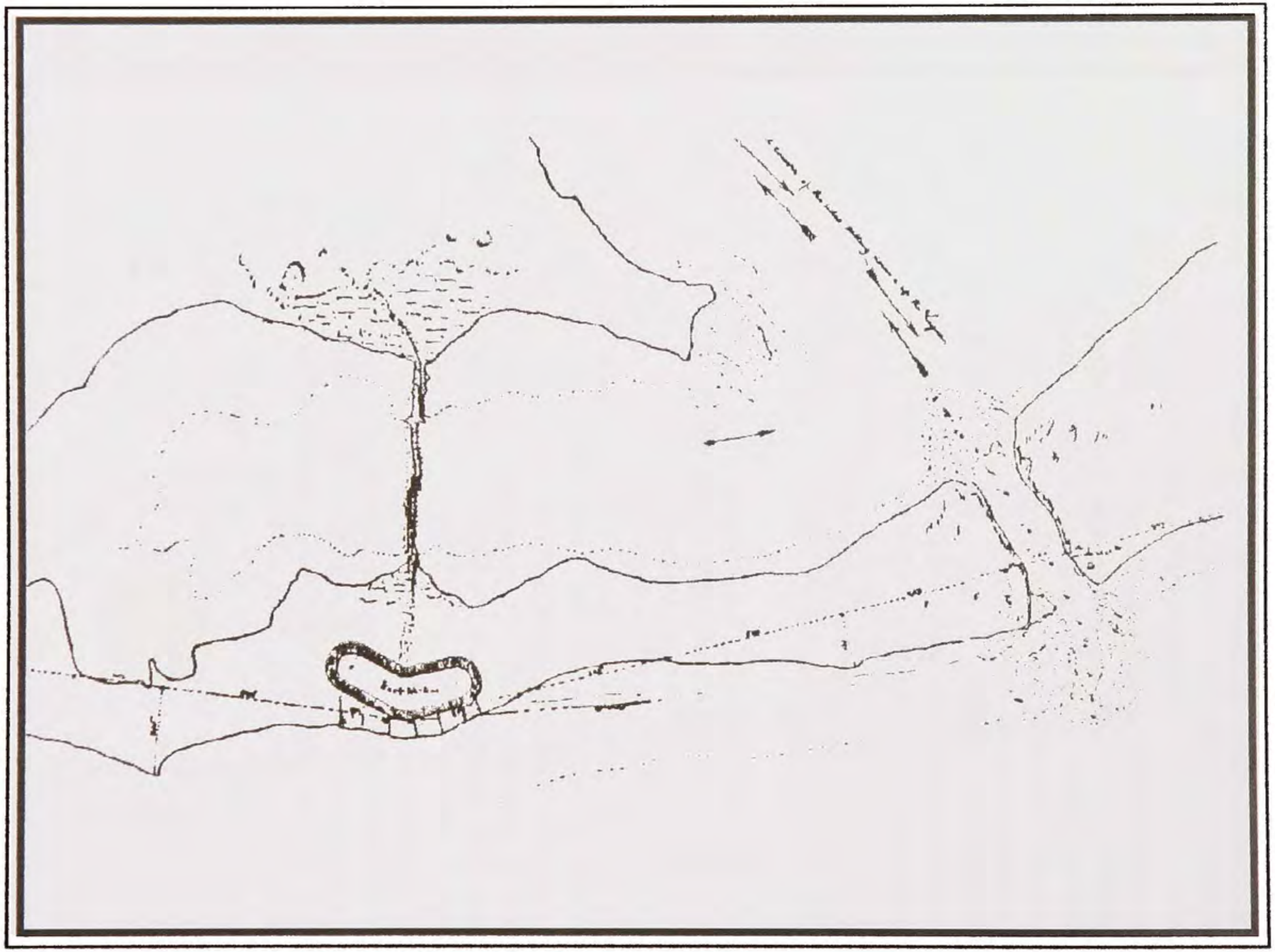
The fort on Mobile Point was authorized under the same legislation as that for Dauphin Island. Unlike Fort Gaines, however, Fort Morgan was completed and garrisoned, only to be taken over by the Confederates at the outset of the Civil War.[41] Bernard designed the polygonal structure which was typical of Third System forts in America. (Fort Gaines, Fort Pickens, and Fort McRee were also Third System forts). Fort Morgan was a massive bastioned structure completed in the early 1830s at a cost of over $1.2 million.[42] The fort was intended to hold substantial armaments. It had 132 guns including fourteen 42-pounders, fifty-two 24-pounders, twenty-six flank howitzers, ten 8-inch howitzers (heavy), and assorted light and heavy mortars. The fort could hold as many as 700 men but had only one company garrisoned as of 1851. Fort Morgan is distinguished architecturally from other Gulf forts because it has a citadel in its center, a feature that figured prominently in the Battle of Mobile Bay.

Fort Pickens was built to protect the entrance to Pensacola Bay after the bay was selected as the site for the Gulf's major naval supply depot. Upon completion in 1844, it was the largest and most heavily armed fort of its type on the Gulf frontier. The fort, built on the western tip of Santa Rosa Island, was structurally similar to Fort Morgan but without the same bastioned edifice (Map 2-1). Fort Pickens' design reflected the rapid changes in fortification engineering in the nineteenth century. The fort could garrison 1,260 troops and was armed with 212 guns; its heaviest armaments included sixty-three 42-pounders, forty-nine 24-pounders, and twenty-six flank howitzers. Fort Pickens was the only fort on the Gulf frontier that was not occupied by Confederate troops, an important factor in the Union blockade of the southern coastline in the closing months of the Civil War.

Fort McRee (Map 2-2) was built across from Fort Pickens to provide additional protection for expanding naval activities around Pensacola. Construction began on the fort at Foster's Bank in 1833 and was completed along with Fort Pickens, primarily because it was smaller and the construction of Fort Pickens provided necessary supplies. Fort McRee held 151 guns, composed of 24-, 32-, and 42-pounders and heavy 8 inch howitzers. Its occupation by Confederate troops during the early part of the Civil War was offset by occupation of the larger and more powerful Fort Pickens.



Map 2-1. A portion of a map of Santa Rosa Island showing Fort Pickens and some related structures, no date (National Archives).



Map 2-2. A portion of a sketch showing the outline and position of Fort McRee, Foster's Bank, Pensacola Bay, 1849 (National Archives).

1 Willard B. Robinson, *American Forts: Architectural Form and Function* (Urbana, IL: University of Illinois Press, 1977), p. 86. Hereafter cited as *American Forts*.

2 Comparative values for historic expenditures are hard to determine accurately. One method would be to compare the proposed fortifications costs against other figures for the period. Using statistics of value of exports for 1810, the $17 million cost for the forts was greater than twice the value of exports from Virginia, North and South Carolina, and Georgia ($7.4 million). New York's exports were valued at $12.5 million. See Ralph H. Brown, *Mirror for Americans: Likeness of the Eastern Seaboard, 1810* (New York: Da Capo Press, 1968), p. 108.

3 *American Forts*, p. 89.

4 Ian Hogg, *The History of Fortification* (New York: St. Martin's Press, Inc., 1981), p. 122.

5 ibid., pp. 124 125.

6 James R. Hinds and Edmund Fitzgerald, Bulwark and Bastion: *A Look at Musket Era Fortification With a Glance at Period Siegecraft* (Las Vegas, NV: Reprinted from the Council on Abandoned Military Posts Periodical, 1981), p. 4; see also Hinds' chapter, "Stone Walls and Iron Guns: Forts and Their Effectiveness in the Civil War," in *Bulwark and Bastion*.

7 Emanuel R. Lewis, *Seacoast Fortifications of the United States: An Introductory History* (Annapolis, MD: Leeward Publications, Inc., 1979), p. 31. Hereafter cited as *Seacoast Fortifications*.

8 Ibid., p. 37; see also U.S., Congress, House, Committee on Military Affairs, *Permanent Fortifications and Sea Coast Defences*, H. Rept. 86, 37th Congress, 2d sess., 1862, p. 2. Hereafter cited as *Permanent Fortifications*.

9 *Seacoast Fortifications*, p. 42.

10 *American Forts*, p. 97.

11 ibid.

12 The French impact on military engineering can be seen in the use of both design and terminology. Although original designs for fortification plans were altered, sometimes dramatically, the basic language used to describe whatever had been designed or redesigned continued to be French. See Appendix I.

13 *American Forts*, p. 121.

14 *Permanent Fortifications*, p. 45.

15 ibid.

16 ibid., p. 56.

17 ibid., p. 105.

18 U.S. Congress, House, Committee on Military Affairs, *Letter from the Secretary of War, Transmitting, In Compliance with the Resolution of the House of Representatives, A System of National Defence and the Establishment of National Foundries*, H. Rept. 86, 37th Cong., 2d sess., 1862, pp. 139 142.

[19] ibid., p. 141.

[20] ibid., pp. 406 407.

[21] ibid., p. 509; *Seacoast Fortifications*, p. 66.

[22] RG 77, Entry No. 20, Letters and Papers Received, 1789 1831 (Irregular Series), Box 9, Folder 125 132(G), Item 127, June 20, 1821.

[23] RG 77, Entry No. 1237, Letters Sent from Fort Morgan, Mobile Point, Box 418, Book 1821 1828, Letter from Capt. De Russey to Col. W.K. Armistead, Chief of Engineers, May 12, 1821.

[24] Virgil Davis covers the problem of bricks for construction in great detail. See *Mobile District History*, pp. 6-15.

[25] RG 77, Entry No. 20, Letters and Papers Received, 1789 1831 (Irregular Series), Box 9, Folder 111 114 (G), Item No. 112 Abstract of papers and correspondence relating to the Dauphin Island contract.

[26] ibid.

[27] ibid., Folder 125 132 (G), Item 127.

[28] RG 77, Entry No. 1237, Letters Sent from Fort Morgan, Mobile Point, Box 418, Book 1821 1828, Letters from Capt. De Russey to the Chief of Engineers May 12, 1821, June 6, 1821, June 8, 1821, and July 1, 1821.

[29] ibid., Letter dated November 6, 1826.

[30] RG 77, Entry 1266 - Daily Reports of Operations on the Construction of Fort Morgan, *Mobile Point*, 1828, 8 volumes. arranged chronologically. 1828.

[31] ibid.

[32] RG 77, Entry No. 1237, Letters Sent from Fort Morgan, Mobile Point, Box 418, 1821 1828, Letter from de Russey to Chief of Engineers dated February 6,1825.

[33] RG 77, Entry No. 20, Letters and Papers Received, 1789 1831 (Irregular Series), Box 9, Folder 125 132 (G), Item No. 127 Letter from Augustus Green dated June 20, 1821.

[34] *Mobile District History*, p. 42.

[35] The fever season lasted several months, and was most dangerous in late summer. Hurricane season officially lasted from May until September, but storms associated with early winter rains also created problems. Many of the Engineers, and certainly the workers from outside the South, were unfamiliar with the intensity and duration of squalls and torrential rains associated with the subtropical climate.

[36] RG 77, various entries covering general correspondence. See Entry Nos. 4, 6, and 9, pp. 1266-69

[37] RG 77, Entry No. 1237, Letters Sent from Fort Morgan, Mobile Point, Box 418, 1821 1829, Letter from de Russey to Armistead dated June 8, 1821.

[38] General correspondence contains specific reference to problems of lost or delayed mail. RG 77, Entry No. 6, Letters Sent to Engineer Officers, 1812-69, pp. 37 (letter dated 12 November 1818) and 52 (letter to Gadsden dated 10 March 1819).

[39] *American Forts*, p. 121.

[40] ibid.

[41] None of the seacoast fortifications constructed in the first half of the nineteenth century were ever fired on by a foreign enemy. The system experienced its first real test during the Civil War.

[42] Joseph G. Totten, *Report of General J.G. Totten, Chief Engineer, on the Subject of National Defences* (New York: Arno Press, Inc., 1979), pp. 96 97. Reprint of the 1851 edition printed by A. Boyd Hamilton, Washington, D.C.

III. Frontier Civil Works

Projects on the Gulf frontier were spread over a large territory. The Engineer's responsibility was to oversee the construction of forts authorized as part of the seacoast defense system. Reconnaissance surveys for river and harbor improvements, canals, and roads were conducted as well, although these tasks usually were related to national security rather than internal improvement. Along the Gulf frontier, surveys extended from the Sabine and Red rivers in western Louisiana to central Florida. At that time, formal Engineer offices were not designated; rather offices coincided with the Supervising Engineer's place of residence.

The Corps of Engineers has performed a dual function since early in the nineteenth century. Congress tasked the Corps, as the nation's only body of formally trained engineers, with surveying and examining rivers and streams, potential overland routes, and any physical phenomena that might be associated with internal improvements of national scope or importance.

The Gallatin report submitted to Congress in the early nineteenth century became the foundation for congressional activity related to internal improvements. The House Committee on Roads and Canals chose the Corps to conduct the requisite surveys and examinations as, "They are a well disciplined and organized body, and composed of the most capable of our scientific men..."[1] Settlers moving westward were pressuring Congress to develop a national transportation network to facilitate population expansion and to access Atlantic seaboard markets. By the 1830s, the success of the Erie Canal sparked congressional interest in other parts of the country.

The South was insignificant in the national scheme of internal improvements; the region was sparsely settled and many of its settlers had a strong anti-Federal bias.[2] The southern preference for dispersed settlement resulted in a local governance system situated in the county seat. Most of the population then lived, and to some extent still does, in scattered crossroad settlements fanning outward from the county seat. This dispersed settlement pattern made establishing a uniform road system difficult and costly. The lack of a major transportation network, either local or regional, is cited as a major factor in the South's failure to industrialize. Because of this weak industrial base, Congress hesitated to fund projects of limited regional (much less national) value. As a result, few civil works projects were initiated in the South prior to the post-Reconstruction period. The Corps, therefore, had little responsibility for civil works in the South during the antebellum period.

Despite lack of support in Congress, southern politicians lobbied vigorously for internal improvements. With confirmation of Alabama's statehood in 1819, politicians began to petition Congress for funds to construct canals; the state's abundant water resources and their potential for commercial development were offered as justification.

Fierce debates took place over possibly connecting the Tennessee River Valley to the Gulf of Mexico via Mobile Bay. Such a linkage would diminish New Orleans' commercial dominance and funnel the trade of America's interior through the heart of the Deep South. The Gallatin report recommended connecting some of Alabama's rivers with canals, principally to join the Tennessee River and the Gulf of Mexico.

Another recommendation was to connect Pensacola and Mobile with a canal, which would be part of a larger system linking New Orleans and the other major ports of the Gulf. Petitions were submitted as well for improvement of harbors, including those at Pascagoula and Apalachicola, but met with little success.

The Committee on Roads and Canals ultimately concluded that no monies would be spent on the various petitions offered by Alabama or any other state until the necessary plans, surveys, and estimates were received from the Corps of Engineers. The early Alabama surveys did address the possibility of connecting the Coosa River with the Tennessee River, which then would provide access to the Gulf of Mexico through the Alabama-Coosa River system, and linking Pensacola and Mobile by canals.

The Early Surveys

Early surveys were associated closely with the seacoast fortification projects being developed and were, for the most part, minor in nature. Streams and lands near fort sites were surveyed to determine the availability of and means of transporting useful construction materials. Among the items sought were stone, clay (for brick making), and timber suitable for framing and other purposes. Occasionally, a survey might have commercial application, but more often was for military purposes, such as examining a stream's suitability for transporting troops or supplies. The major surveys for the Gulf frontier included the Pensacola-Mobile canal survey, the Tennessee-Coosa canal survey, and a military road survey related to connecting Washington, DC with New Orleans.

The Pensacola-Mobile Canal

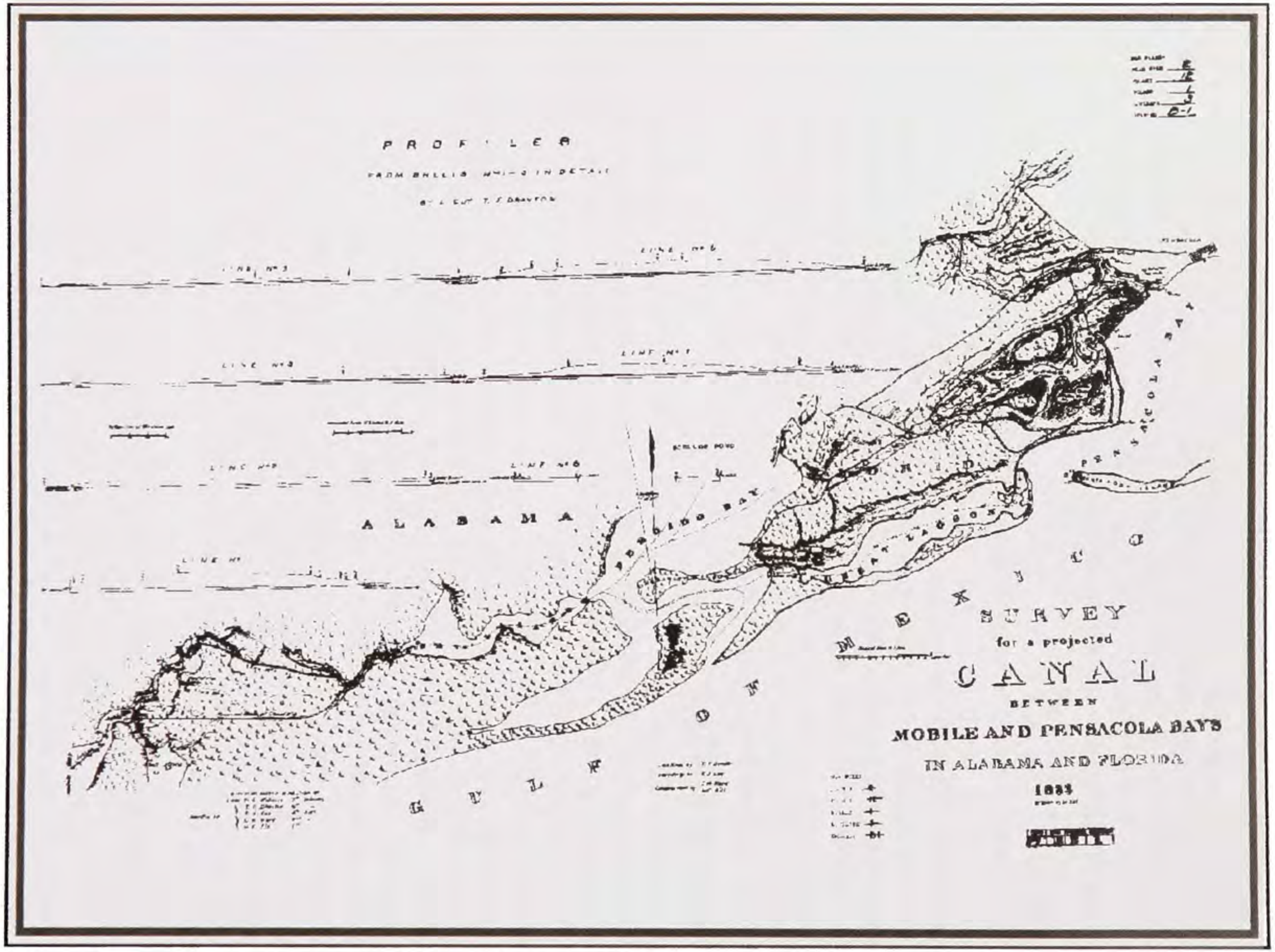
The Board of Engineers for Fortifications' 1817 reconnaissance of the Gulf frontier highlighted the strategic advantages of Pensacola, although the board was concerned about the site's lack of access to supplies during times of critical need. The board proposed connecting Pensacola with the Mississippi River because New Orleans served as the major supply depot for the entire Gulf frontier.

A significant portion of such a link could be by way of the Mississippi Sound from the Rigolets to Mobile Bay. The board viewed the sound as a "natural canal" that could be extended by a manmade canal. Bernard, therefore, recommended that a sloop canal be constructed from Bon Secour Bay on the eastern side of Mobile Bay, to the Great Lagoon at the entrance to Pensacola Bay, a distance of about 30 miles.[3]

Constructing the Mobile-Pensacola canal would require other minor supporting projects. For example, Bernard and Captain William T. Poussin, a topographical engineer and assistant to the board, reported that it would be necessary to connect Mobile Bay with the Mississippi Sound by deepening the Pass au Heron channel between the mainland and the eastern end of Dauphin Island.[4]

Although proposed as early as 1817, the Pensacola-Mobile survey was not authorized until the 1830s. Conducted by Lieutenant J. F. Drayton of the infantry and Lieutenants T. J. Lee, G. W. Ward, and H. G. Sill of artillery, the survey indicated that the Bon Secour River was the only realistic route for connecting Pensacola and Mobile. A portion of the canal would make use of the Bon Secour's channel. A land cut would connect the river with Bear Creek, allowing boats to get into Lalande Bay and from there into Perdido River. A second land cut would connect the Perdido River to Pensacola Bay. Both upper and lower routes were proposed.[5]

The cost of a Mobile-Pensacola canal was projected at $2.2 million for the most efficient route and $1.2 million for the most economical route (Map 3-1). The strategic advantage of the canal was substantiated in Captain Daniel Burch's report to the Army Quartermaster General. Burch conducted a reconnaissance of the area between Mobile and Pensacola bays to determine the feasibility of constructing a military road.[6] Although never



Map 3-1. Survey for a projected canal between Mobile and Pensacola Bays in Alabama and Florida, 1833 (National Archives).

constructed as envisioned, the canal was one of the earliest proposals for an inland waterway connecting Florida's panhandle with the Mississippi River. The idea was realized with completion of the Gulf Intracoastal Waterway in the twentieth century.[7]

The Tennessee-Coosa River Canal

A second important survey on the Gulf frontier involved determining the feasibility of connecting the Tennessee River with the Gulf coast. As the most valuable agricultural land in Alabama, the Tennessee River Valley attracted settlers well before lands in the central and southern parts of Alabama were occupied. Even though much of the state south of the Tennessee River remained in Indian hands until the 1830s, thus impending western movement, settlers continued to seek better agricultural lands.

As early as 1826, the Committee on Roads and Canals was considering a memorial from the State of Tennessee to connect the Tennessee River via a canal to the Coosa River in Alabama. The memorialists vigorously supported the need for such a project, touting national, commercial, and military advantages. Among those postulated were the delivery of supplies from the interior to the naval establishment at Pensacola, the protection of the interior from foreign invasion or internal disturbance, and the ease with which materials could be moved along the axis of greatest trade. It was even suggested that such a canal could connect the Gulf of Mexico with the Chesapeake Bay if improvements were made to the Shenandoah and Holston Rivers.[8]

In 1827, Congress authorized Bernard and the Board of Internal Improvements to survey the Tennessee Valley in Alabama to determine the feasibility of a canal connection to the Gulf of Mexico. One major problem was that the canal would cross the home of the Cherokee Nation, land that was not ceded by the Indians until the mid-1830s. Another obstacle was the fact that ill health and bad weather prevented the board from visiting to the area. Thus, recommendations were based on preliminary work already conducted by Lieutenant Jefferson Vail of the infantry.[9]

Surveys often were delayed, usually because of inadequate personnel. The presidential prerogative of assigning Corps officers to conduct surveys for internal improvements stretched the organization's ability to manage its military mission. Geographic distance, poor health, and natural hazards were other ongoing impediments to operations.

The Gulf frontier was no more lacking in manpower than most of the country. Travel conditions were more difficult than in other parts of the eastern United States, however, and were a factor in the successful completion of any Engineer reconnaissance. The manpower issue was repeatedly addressed in the Chief of Engineers Annual Reports to Congress.

Manpower shortages notwithstanding, the survey was completed successfully. The route recommended to connect the Tennessee and Coosa Rivers was between the Okoa, a headwater branch of the Hiawassee River (a tributary of the Tennessee) and the Conesauga River, a headwater branch of the Coosa. The best site for the canal reservoir, dam, and other structures was a depression in the ridge dividing the Conesauga and Hiawassee valleys. The respective heads of navigation for the two rivers were at Heltebrand's Boatyard on the Okoa and McNair's Boatyard on the Conesauga.[10] The route already functioned as a portage for residents of East Tennessee, who used special vehicles to transport their boats.[11]

The final determination of the Board of Internal Improvements was that a canal approximately 100 miles long, beginning at the head of steamboat navigation on the Hiwassee River and ending at the head of steamboat navigation on the Coosa River, would best connect the Tennessee and Coosa valleys.[12] The construction would be a major undertaking, and the report described the project as having "great national importance."[13]

Bernard felt that if the canal's proposed route made it too expensive, then the alternative was to construct a railroad, in a different location, to connect the Tennessee Valley with the Gulf of Mexico. His suggested route was from "Cotton-gin Port, on the Tombeckbee, to Waterloo, on the Tennessee; connecting these two streams would procure the shortest communication between the mouth of the Missouri and the Gulf of Mexico."[14] The Tennessee-Tombigbee Waterway, completed 150 years later, would align approximately with Bernard's suggested railroad route.

The proposed Tennessee-Coosa canal was in Cherokee territory and the Indians had to be convinced to sell the U.S. government land for a right-of-way. F. W. Armstrong was dispatched to the Cherokee Nation to ascertain whether the Indians would cooperate. He met with the Indian agent, Chief William Hicks, Chief John Ross, and other tribal leaders. Armstrong reported to the Secretary of War that the Cherokees would not allow the government to build a canal in their territory and that further U.S. efforts to convince them otherwise would be wasted. The indians' refusal to compromise hurt later when public hostility was running high over confiscation of Cherokee lands and the Indians' forced move westward.[15]

The Tennessee-Coosa canal was to be one link in a more expansive canal system that promoters and the U.S. government hoped would connect the Mississippi River with the Atlantic coast. The Ohio, Tennessee, Etowah, Ocmulgee, and Altamaha Rivers, together with canals that would serve as additional links, were to constitute a southern navigation system. However, the idea of a southern navigation network waned as the railroad grew in popularity.[16]

The plan for a canal system to connect the Tennessee and Coosa Rivers was abandoned as too ambitious. Nevertheless, the idea of connecting the Tennessee and Coosa Rivers was revived periodically, particularly in the period of significant river and harbor improvements following the Civil War. Connecting the two river systems was still considered as late as the turn of the century.[17]

Other Civil Projects

The government had little money to spend during the early decades of the nineteenth century. The panic of 1837 exacerbated the situation, and as a result, appropriations for civil works were sporadic. Larger national issues sidetracked internal improvement legislation. The Mexican War in the 1840s, for example, was not only costly but caused Congress to focus on national security and territorial expansion. As a consequence, the Engineers assigned to the Gulf region had few civil works assignments. Any civil works projects authorized were in some way connected with supporting the seacoast fortification system. Because the mouths of all rivers flowing into the Gulf of Mexico were obstructed, routine work included removing snags and sandbars. A stream's importance was based on whether it was useful for securing or transporting supplies and materials from one fort site to another.

One major project authorized was a reconnaissance of the territory between Pensacola and Mobile. The government was interested in a military road connecting Pensacola, Mobile Point (where Fort Morgan was under construction), and the City of Mobile. The report was authorized by the Quartermaster General's office and was made to the Committee on Roads and Canals, along with other surveys completed under the Corps' jurisdiction. Nearly all surveys conducted on the Gulf frontier were inspected by Captain William H. Chase, Supervising Engineer for Gulf fortifications.[18]

The proposed road between Pensacola and Mobile Point was to be entirely for military purposes. It would pass through sparsely settled and environmentally inhospitable country; the best route was considered to be across the Perdido River at Innerarity and Bear Point. This constituted almost a straight line approximately 55 miles long.[19] The road from Mobile Point to Blakeley would pose greater construction and maintenance problems than the section from Pensacola to Mobile Point, and it would be some 10 miles longer. The report recognized that the roads would rapidly fall into disrepair because of the limited use and because the area held too few inhabitants to maintain them.[20]

In 1829, Chase conducted a survey between Lake Pontchartrain and Mobile Bay to determine where to build lighthouses and fix buoys for navigation. Work was already in progress at Pass au Heron (between Dauphin Island and the Alabama mainland) on deepening the channel to accommodate the largest vessels entering Lake Pontchartrain. All of this was intended to improve the Mississippi Sound inland navigation route between New Orleans and strategic ports along the Gulf frontier.[21] Chase's report recommended that small lighthouses be constructed at Sand Island and Pass au Heron. He recommended a more substantial structure to replace the badly deteriorated lighthouse at Mobile Point.

Work also was authorized to improve Mobile's excessively shallow harbor, which was only 5.5 feet deep at Choctaw Pass and 8 feet deep at Dog River Bar. Under existing conditions, the wharves at Mobile were inaccessible to larger vessels because of channel obstructions, and cargo had to be transferred to shallower draft vessels before reaching the City (Map 3-2).[22] This posed an economic disadvantage which placed Mobile in a weakened position to compete with New Orleans. Alabama legislators successfully petitioned Congress for some relief, and the Corps of Engineers undertook a project to improve navigation to the city.

Mobile Harbor

The first phase of the harbor improvements project involved creating and unobstructed channel 10 feet deep and 200 feet wide from Mobile to the Gulf of Mexico.[23] Unfortunately, pressures to maintain construction schedules for the forts at Mobile Point and Santa Rosa Island interrupted appropriations. Inadequate funding was compounded by contract difficulties and weather related setbacks. As a result, little was accomplished toward improving navigation until after the Civil War.

The Chief of Engineers' *Annual Report* for 1832 describes various civil and military projects underway on the Gulf frontier.[24] A four-foot channel was dredged at St. Marks Harbor in Florida and a bridge was begun over the St. Marks River. Aside from minor clearing of obstructions along the Apalachicola River, the Crops removed all trees along the edge that were likely to fall into the river. Work on the Channel project at Choctaw Pass in Mobile Bay had been suspended because the dredge had sunk. The clearing of obstructions from the mouth of the Pascagoula River was suspended. Reports made by the Chief of Engineers to Congress indicate similar operations and periodic surveys were conducted annually until 1861. After that time, all Corps activities authorized in the national interest were disrupted by the Civil War.

Map 3-2. A map of Mobile Bay in the State of Alabama, 1844 (National Archives). A copy of the map was provided to Lieutenant Ogden while he was stationed at Fort Morgan.

1 U.S. Congress, House, *Report of the Committee on Roads and Canals, upon the Subject of Internal Improvements,* H. Rept. 98, 17th Cong., 1st sess., 1822, pp. 3-4.

2 Both historians and geographers have written about the cultural distinctiveness of the South. For a geographer's viewpoint, see Milton B. Newton, Jr., "Cultural Preadaptation and the Upland South," *Geoscience and Man,* 5 (June 1974): 143-154; and Milton B. Newton, Jr., "Settlement Patterns as Artifacts of Social Structure," in *The Human Mirror: Material and Spatial Images of Man,* Miles Richardson, ed. (Baton Rouge, LA: Louisiana State University Press, 1974), pp. 339-361; E. Estyn Evans, "The Scotch Irish: Their Cultural Adaptation and Heritage in the American Old West," in *Essays in Scotch-Irish History*, R. R. Green, ed. (London: Routledge and Keegen-Paul, 1969); and Fred B. Kniffen, "Folk Housing: Key to Diffusion," *Annals of the Association of American Geographers,* 55 (1965): 549-577. For the classic historians work, see Frank L. Owsley, *The Plain Folk of the Old South* (Baton Rouge, LA: Louisiana State University Press, 1949). In more recent years, a series of shared articles has received mixed attention from historians but it germane to the issue present here. See Forrest McDonald and Grady McWhiney, "The Antebellum Southern Herdsman: A Reinterpretation," *Journal of Southern History,* 41 (1975): 147-166; Forrest McDonald, "The Ethnic Factor in Alabama History: a Neglected Dimension," *Alabama Review,* 31 (1978): 256-265; and Forrest McDonald and Grady McWhiney, "The South from Self-Sufficiency to Peonage: An Interpretation," *American Historical Review,* 85 (1980): 1095-1118.

3 U.S. Congress, House, *A Report and Maps of a Survey of Canal Routes through Florida*, H. Doc. 61, 23d Cong., 1st sess., 1833, p. 61.

4 Ibid., p. 66

5 Ibid.

6 Ibid., pp. 75-76.

7 Lynn M. Alperin, *History of the Gulf Intracoastal Waterway,* (Fort Belvoir, VA: Institute for Water Resources, 1983), pp. 7-8. Hereafter cited as *History, GIWW.*

8 U.S. Congress, House, *Canal-Tennessee and Coosa Rivers,* H. Rept. 220, 19th Cong., 1st sess., 1826, p. 2.

9 U.S. Congress, House, *Hiwassee and Conesauga Rivers*, H. Doc. 15, 20th Cong., 2nd sess., 1828, p. 2.

10 Ibid., p. 13.

11 Ibid.

12 Ibid., p. 5.

13 Ibid.

14 Ibid., p. 6.

15 Ibid., p. 8.

16 William Elejius Martin, *Internal Improvements in Alabama*, (Baltimore, MD: The John Hopkins Press, 1902), p. 38. Hereafter cited as *Internal Improvements.*

17 Ibid., p. 19.

18 Chase had a long and distinguished career with the Corps of Engineers and was stationed for most of his tenure at Pensacola. He retired to Chasefield, his estate near Pensacola. For nearly 30 years, he was the pillar of the engineering community on the Gulf frontier. For a detailed report on Captain Chase's importance to engineering operations on the Gulf frontier, see Ernest F. Dribble, "William H. Chase: Fort and Prosperity Builder," *Ante-Bellum Pensacola and the Military Presence*, pp. 31-45, Vol. 3, of *The Pensacola Series Commemorating the American Revolution Bicentennial*, (Pensacola, FL: *Pensacola News-Journal*, 1974).

19 U.S. Congress, House, *Letter from Daniel E. Burch, Assistant Quartermaster to Brig. Gen. Thomas S. Jesup, Quartermaster General*, H. Doc. 52, 20th Cong. 2nd sess., 1829.

20 Ibid.

21 U.S. Congress, House, *Message from the President of the United States, Transmitting Copies of Surveys*, H. Exec. Doc. 7, 21st Cong., 1st sess., 1829 pp. 14-16. This document illustrates the difficulties in conducting timely surveys. The survey was authorized in 1824, completed in May 1829, and submitted to Congress in December of the same year. Delays were not a consequence of neglect; rather, surveys had to be accomplished between field staff tasks assigned by the Chief of Engineers. Chronic understaffing plagued the Corps of Engineers until well into the twentieth century.

22 *Internal Improvements*, p. 54.

23 Ibid.

24 U.S. Congress, House, Committee on Roads and Canals, *Report of the Chief of Engineers on the Public Works of Internal Improvements*, H. Doc. 12, 22nd Cong., 2nd sess., 1832, p. 95.

IV. The Civil War, 1861 - 1865

The Civil War was the first major interruption in operations on the Gulf frontier since work began in 1815. By the end of 1861, few Army Engineers were left in the Gulf area. A number of the best Engineer officers, some of whom had served on the Gulf frontier, swore allegiance to the Confederacy. The resignation of P. G. T. Beauregard in 1861, and Lieutenant Henry L. Smith shortly thereafter, left Lieutenant Adam J. Slemmer in temporary command at Barrancas Barracks, and later at Fort Pickens in Pensacola Bay. Lieutenant Frederick E. Prime was in charge of fortifications on Ship Island.[1] The Civil War period in the Gulf area was characterized by Confederate efforts to stave off Federal advances against the seacoast forts and Union efforts to blockade southern ports. The first test of the Gulf fortifications, ironically, did not come from a foreign enemy but from Federal troops. The initial assaults on seacoast fortifications taught the government and the Army Engineers a great deal. Although the clay and brick forts were designed to withstand naval bombardment, advances in military firepower technology during the several decades preceding the Civil War had rendered many of the forts obsolete. Nevertheless, some of the forts were so well designed and constructed that capturing them still proved difficult. The Federal assault on Fort Morgan, for example, was costly to the Union in terms of men and supplies, and some inland forts were even harder to conquer. Had the Gulf portion of the fortification system been completed, the Federal blockade force likely would have had to be larger and the capture of the forts would have been costlier.

The state of fortifications during the war was insignificant compared to the larger problems faced by the opposing forces. Yet, the condition of the forts and rapid advances in military technology played a critical role in the Corps' assessment of American defenses after the war. The condition of forts, obstructions to navigation, and the utility of selected harbors were important factors in the new mission of reestablishing commercial viability to American ports such as Mobile and New Orleans.

Engineers on the Gulf and Corps Allegiance

The Civil War aggravated an already severe manpower shortage for the Corps of Engineers. The Chief continued to present his case for an increase in Engineer officers, while Congress continued to call on the Corps' expertise in handling increasing military and domestic tasks for a growing republic. The numerous projects authorized by Congress stretched the Corps to its limit. Thus, the Corps' inability to secure additional officer positions became an acute issue when the nation split and 15 of the 93 Engineer officers resigned to join the Confederacy.[2]

The Confederate Corps of Engineers was organized in March 1861, and consisted of the former Federal officers plus civilian recruits. The officers who resigned from the Corps of Engineers were hardly sufficient in number to accomplish the tasks that lay ahead. Neither side now, for that matter, had an adequate number of engineers and had to recruit civil engineers from the general population.[3]

Among the more prominent Engineers who defected to the Confederacy were Robert E. Lee, Joseph E. Johnston, and P. G. T. Beauregard. Beauregard was perhaps the best known and certainly the most flamboyant Confederate engineer associated with the Gulf region.[4] He served briefly in Pensacola as assistant to Captain (later Major) William H. Chase and was in charge of fortifications when Chase was away on official business for the Engineer Board. Following Chase's return to Pensacola in 1848, Chief of Engineers Totten assigned Beauregard to Mobile Point. Beauregard was to relieve Captain Scarritt and take charge of the construction at Dauphin Island. He was free to take up residence at Mobile or any place in the vicinity of operations suitable to carry out his duties.[5]

Other West Point graduates who left the Corps to join the Confederacy also saw action in the Mobile area. One was Captain Danville Leadbetter, who had been responsible for the armaments modification at Fort Morgan begun in 1857. Leadbetter later served as Assistant Chief of the Confederate Engineers. He began his Civil War career in Mobile and planned the defense of the city and bay.[6] The defense system worked out by Leadbetter was later assigned to a Prussian, Lieutenant Colonel Viktor Ernst Karl Rudolph von Sheliha, who volunteered his services to the Confederacy.[7]

Another distinguished West Point graduate associated with the Gulf frontier was Captain Jeremy F. Gilmer, later Chief of Engineers for the Confederate Corps. Certainly, the most important, though not famous, engineer to shift sides was Chase. He had directed the construction of Forts Morgan and Pickens, among others, and his services in the Confederate engineers was a valuable addition to their limited staff. Chase became a colonel of the Florida State Troops.[8]

Some of the Army Engineers on the Gulf frontier, however, remained loyal to the Federal government. The fortification project under way on Ship Island in the Mississippi Sound was under the superintendency of Lieutenant Frederick E. Prime (Figure 4-1). Prime had already overseen work on fortifications at Mobile and Pensacola. Acting Chief Engineer Lieutenant Colonel Rene De Russey assigned him to replace the project engineer at Ship Island in 1859.[9] After three successive parties of armed men had landed on the island in early January 1861, Prime closed down the project.[10] He later was assigned to duty at Willets Point, New York.[11]

Union Objectives

A critical thrust of the Union campaigns in the South was for control of three major rivers: the Cumberland, the Tennessee, and the Mississippi (the Cumberland and Tennessee formed a V shaped wedge into the heart of the Confederacy). Once all of the rivers were taken by Union forces early 1862, attention shifted to the coastal defenses.[12] By late 1862, all Confederate ports had fallen except Wilmington, Charleston, and Mobile.

Major Union action on the Gulf frontier focused on controlling the various forts and defenses dotting the coastline and putting an end to blockade running. Considerable Federal effort was expended in monitoring the Mississippi Sound (see Map 4-1), where blockade running served to supply various Confederate units and/or supporters in and along the Gulf coast.

The principal base of operations for Federal forces was Ship Island, one of the barrier islands extending eastward from the Mississippi River delta to Mobile Bay. Forts Morgan and Gaines at the mouth of Mobile Bay were commandeered quickly by the Confederates, as was Fort McRee. Slemmer, of Company G, 1st U.S. Artillery, and commander at Barrancas Barracks had spiked the guns and destroyed what ammunition he could not take with him when he abandoned Fort McRee to take possession of the more important Fort Pickens. Although Pensacola Harbor and the U.S. Naval Yard were confiscated by the Confederates, Fort Pickens remained in Federal hands throughout the war (Map 4-2). The Confederates later abandoned Pensacola to Union forces.

Strategic Significance of Mobile

As stated earlier, Mobile's harbor was second in importance to New Orleans, and its geographic location was significant in providing a riverine link with the nation's interior.

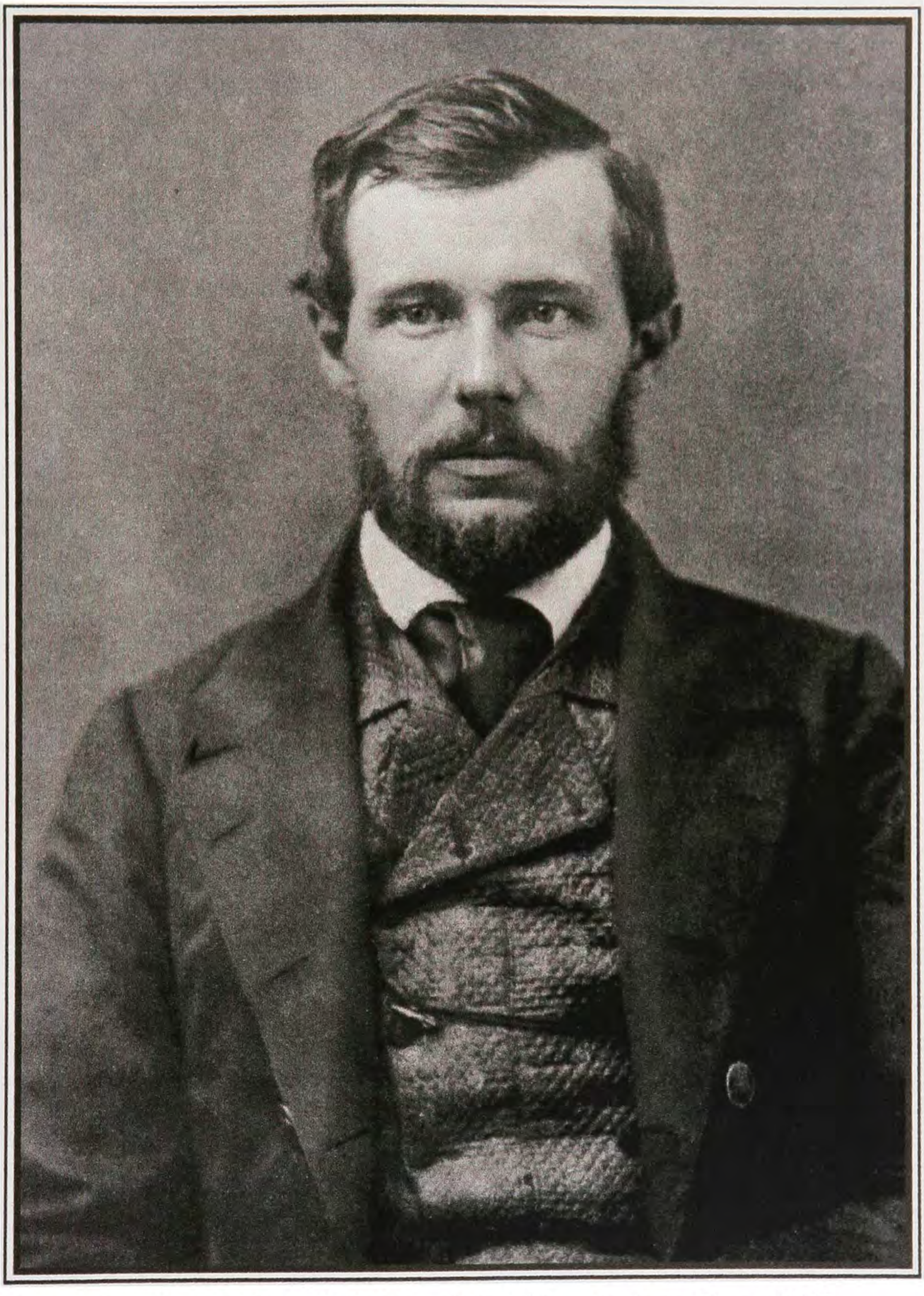
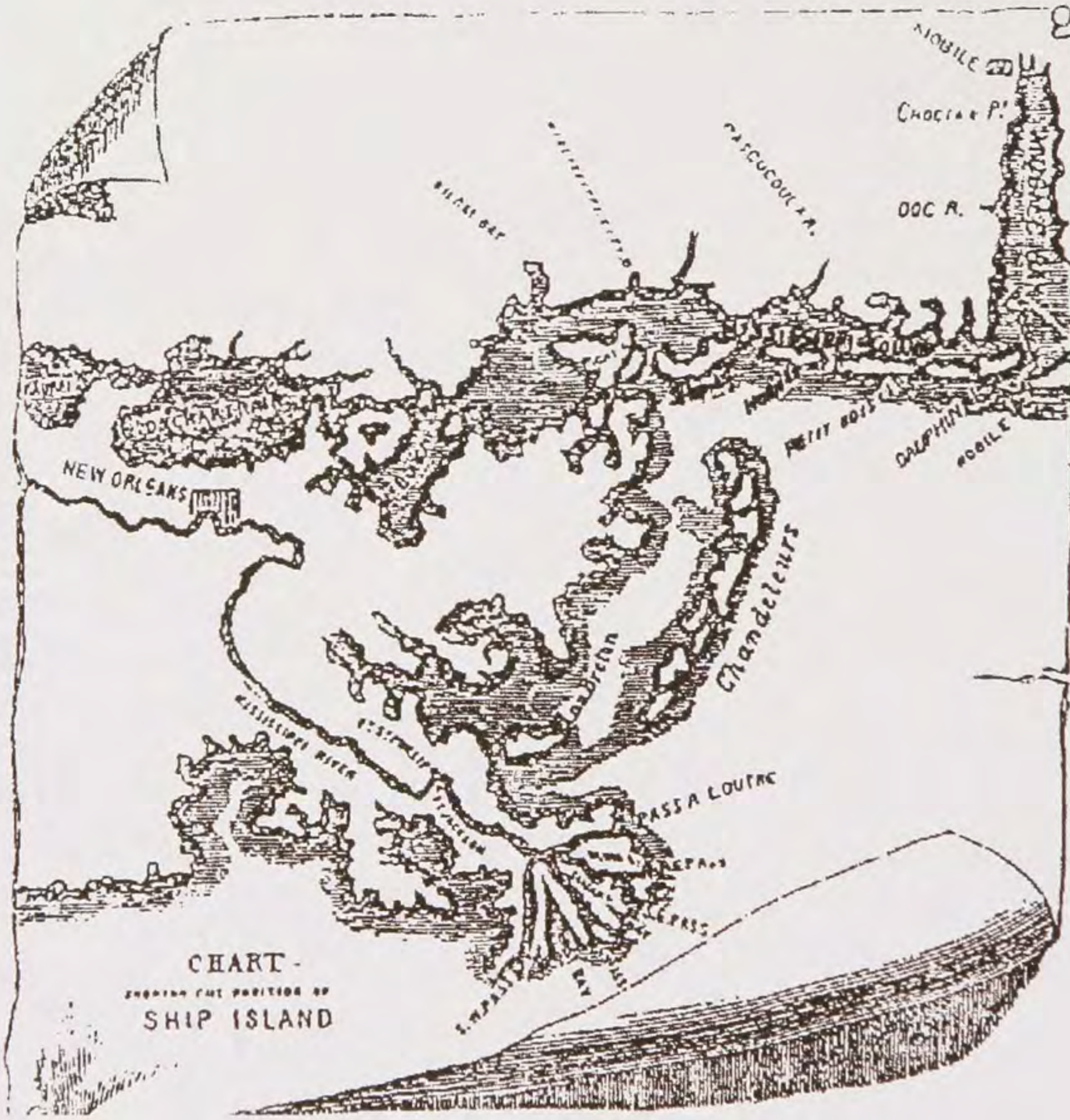
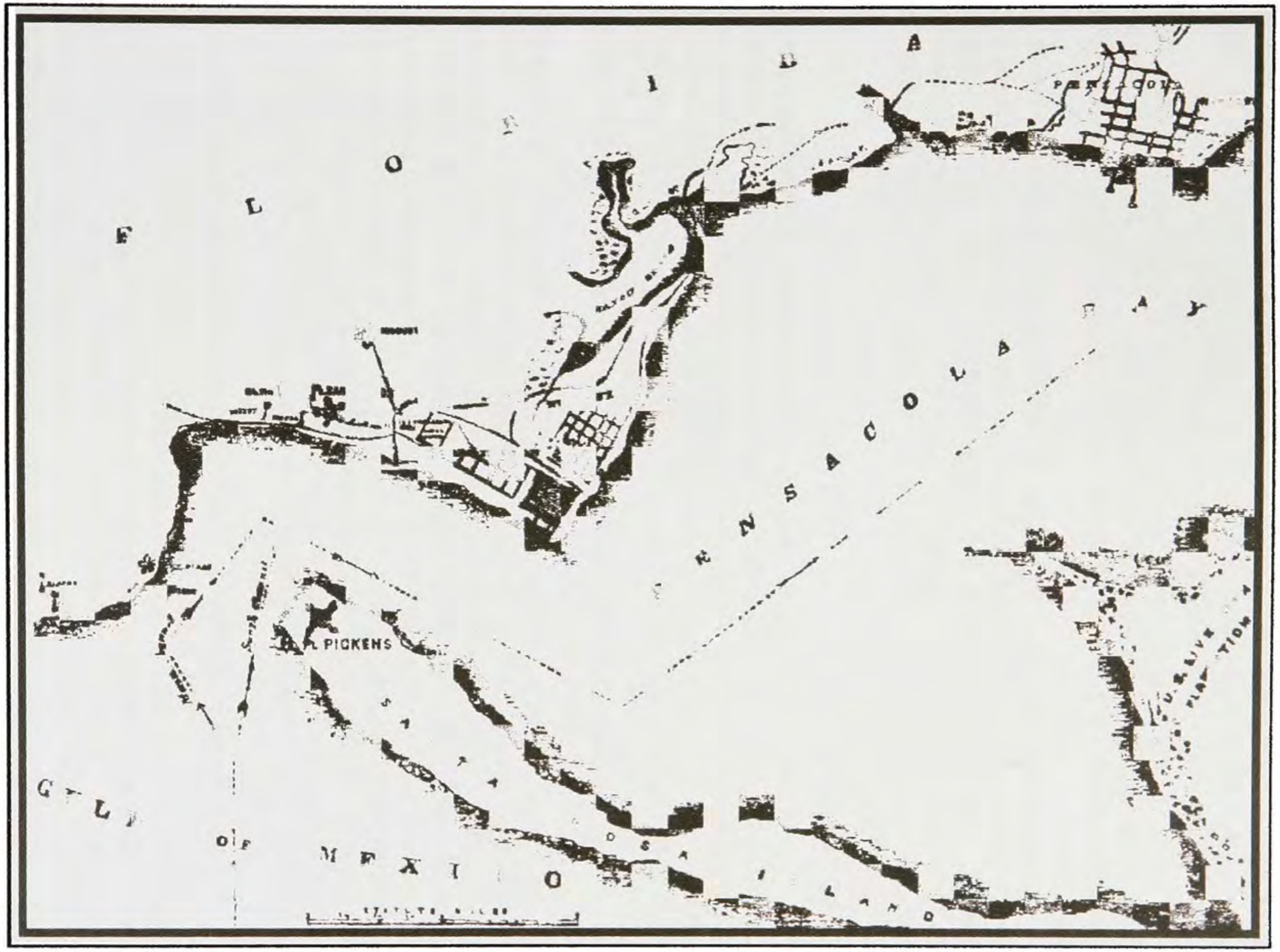


Figure 4-1. Portrait, Frederick E. Prime, U.S. Military Academy Class of 1850 (Public Affairs, the District).



Map 4-1. A map of Mississippi Sound (Harper's 1866).



Map 4-2. A map of the Pensacola fortifications (Harper's 1866).

The network provided by these river systems (the Coosa, Alabama, Tombigbee and Mobile) underscored the strategic value of controlling the head of Mobile Bay (Map 4-3). After New Orleans fell, Union attention focused immediately on Mobile.

The city had become the main supply line for the Confederacy, receiving vital materials for the South's war efforts and serving as the chief link with Cuban cotton markets. However, the shallow waters of upper Mobile Bay allowed only ships with eight-foot draft or less to pass.[13]

Commerce may have been the genesis of Mobile's growth, but Admiral David G. Farragut wanted to seize the city and its defenses for a different reason. He had heard that one ironclad had been completed at the major Confederate arsenal in Selma, on the Alabama River, and that another was under construction.[14] The *Tennessee* had been floated down the Alabama River and over the Dog River Bar on 20 May 1864, and had anchored under the guns of Fort Morgan.[15]

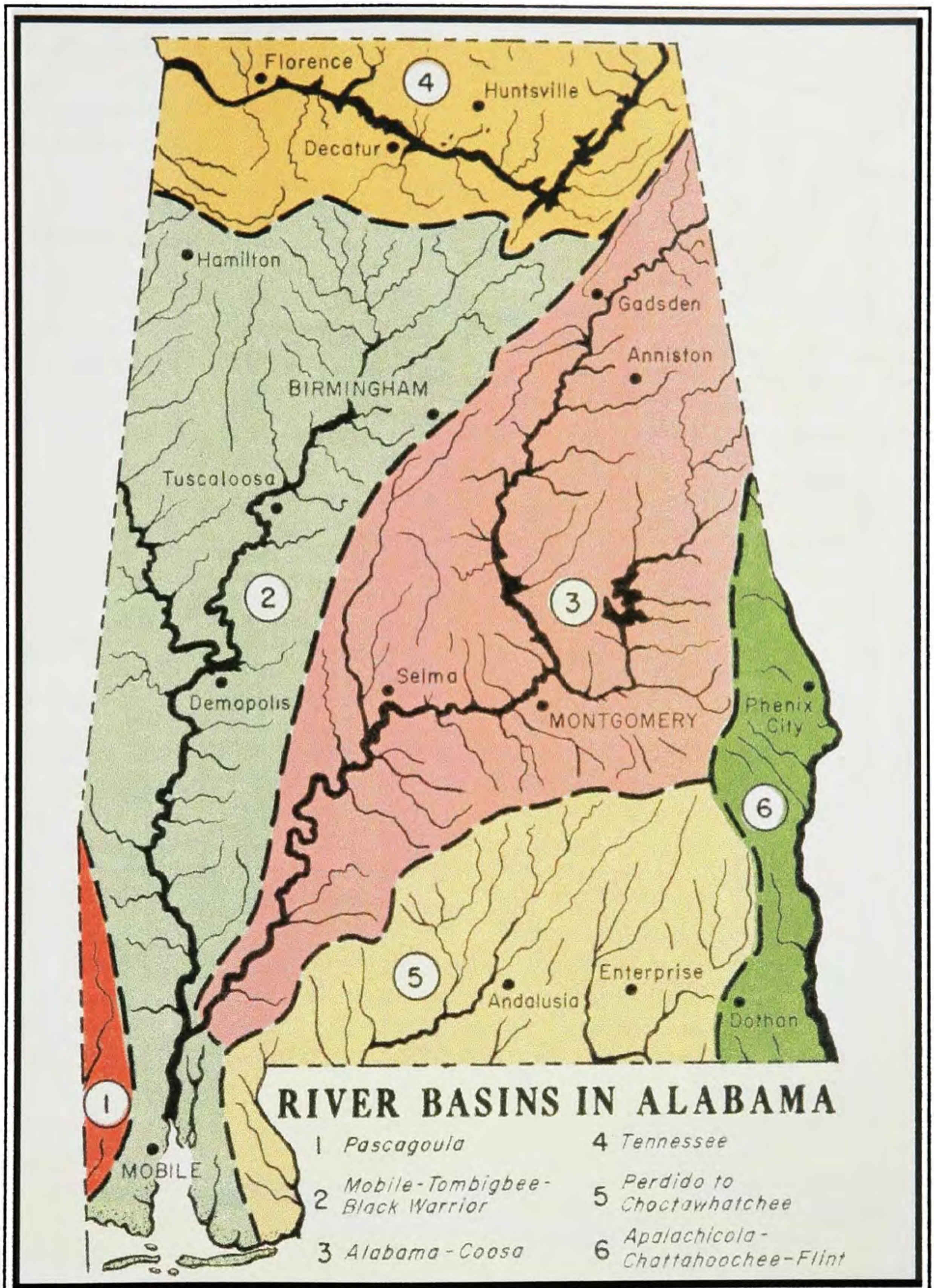
City and Harbor Defenses

In the waning years of the Civil War, Mobile was considered to be the best fortified city in the Confederacy.[16] The first circular earthworks were constructed around Mobile in 1862, a precaution taken by many southern cities in the early years of the war. After the fall of Vicksburg in 1863, Mobile completed a second inner circle. The first circle included 15 redoubts; an additional 16 were added in the second circle. The estimate was that, garrisoned with 10,000 troops, Mobile could withstand a 90 day siege by an army of 40,000.[17] In 1864, a third circle of forts and redoubts was added between the first two, giving an additional 19 heavily bastioned forts and 8 redoubts.

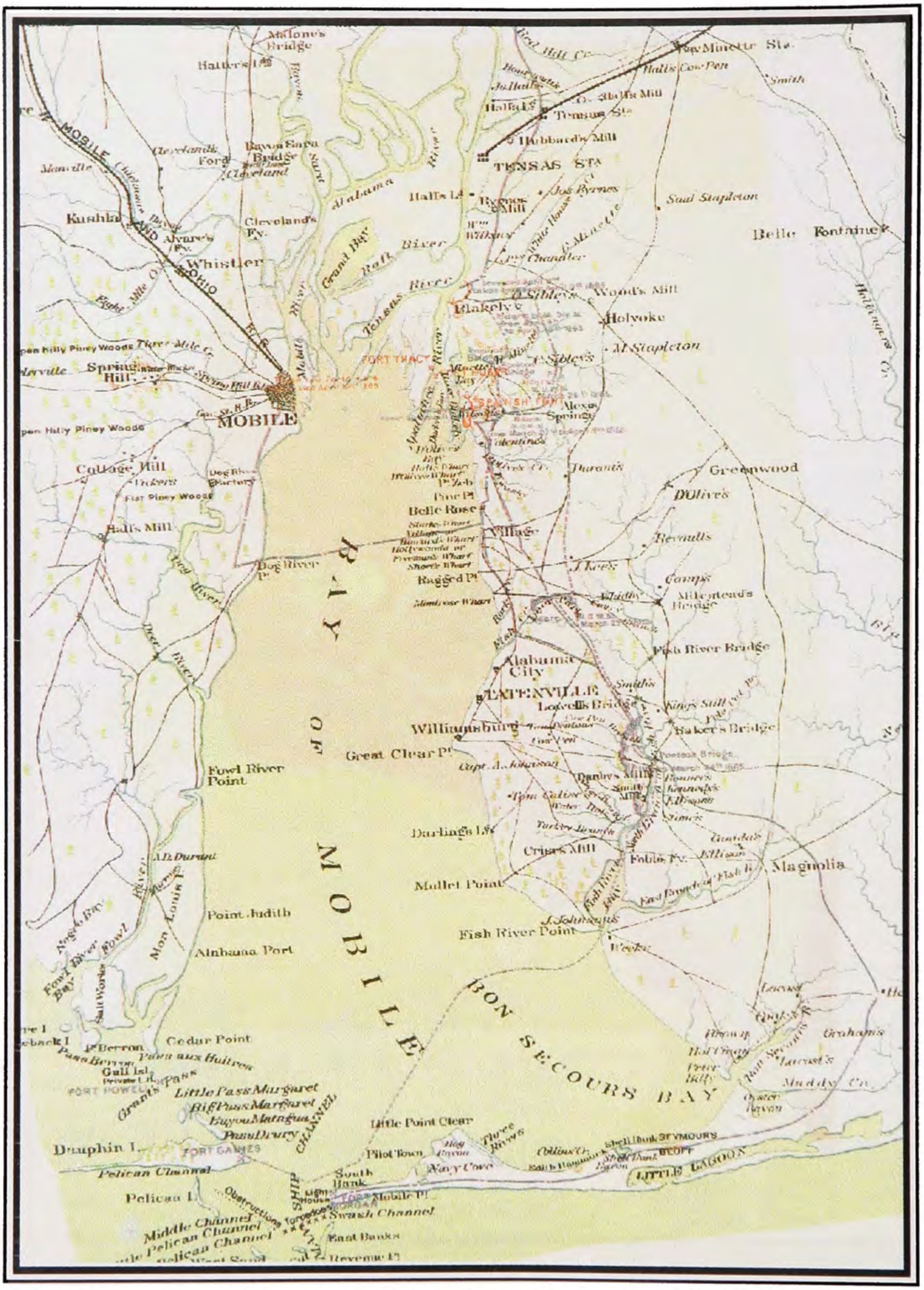
The harbor defenses were impressive as well. Ten batteries were constructed just below Mobile to protect the main channel, and numerous piles were driven to obstruct enemy movement. Although some openings were left in the channel, vessels had to proceed with extreme caution and stay close to the massive guns placed to protect the city. On the eastern shore of the bay, ships initially could avoid the obstacles and the danger of the Spanish River channel (the usual route to Mobile) by coming up the Apalachee River and around through the Tensaw River to approach Mobile directly from the east. The Confederates, therefore, built Batteries Huger and Tracy on low ground along the Tensaw River and piles were driven in the channel to obstruct passage (Map 4-4); torpedoes were placed in many parts of the bay as well.[18]

Another major point of defense was the southern approach to Mobile through Choctaw Pass. The defenses, known as the Dog River Bar obstructions, consisted of a line of steamboats, barges, and flatboats that were loaded with brick and sunk.[19] The sunken vessels then were reinforced by pilings to hold them in place; lines of pilings were extended across various channels to thwart the movement of unfriendly boats. The harbor defenses were supervised by Leadbetter and Captain Charles T. Liernur, another former Army Engineer. Upon their transfers to other theaters of operations, the defenses became the responsibility of Sheliha, who made relatively few changes. Obstructions that filled the harbor and bay after five years of skirmishing created major navigation problems, which Army Engineers had to deal with after the war.

The intended salvation of Mobile was based on the massive fortifications at the mouth of the bay. Forts Morgan and Gaines had offered protection to blockade runners seeking profit and sanctuary in Mobile Bay. Fort Gaines was the smaller of the two and fell to the Union with minimal resistance early in the campaign of 1864. Efforts by Union



Map 4-3. A map of Alabama river basins (Alabama Development Office, 1975).



Map 4-4. Map of Confederate defenses in Mobile Bay *(The Official Military Atlas of the Civil War)*.

forces to end the use of Mobile as a base for blockade running came to a head with the siege of Fort Morgan. The battle for control of the fort was dramatic and decisive in providing Federal control of the Gulf coast, and is considered one of the most important and famous naval battles of the Civil War.

The Battle of Mobile Bay

The strategic importance of the Mississippi Sound was stressed by the various Engineer Board reports and by Army Engineers stationed at Fort Morgan who had investigated the Gulf coast defenses. When Admiral Farragut began his campaign against the defenses of Mobile, the eastern entrance of the Mississippi Sound was defended by Fort Powell, a small but effective earthwork located at Grant's Pass (Map 4-5). The fort was situated so that any vessel approaching Fort Morgan from the Mississippi Sound was vulnerable to raking fire from Forts Powell and Gaines.[20]

Consequently, a land assault had to be made for control of Fort Gaines, and possibly Fort Powell as well, and to cut off any crossfire from the two western forts. The Federals had hoped to lay siege to Forts Morgan and Gaines simultaneously, but were hampered by geography and insufficient troops. Union troops under Major General Gordon Granger sailed from New Orleans via the Rigolets and the Ship Island anchorage, and on 3 August 1864 they landed on the western end of Dauphin Island, about seven miles from Fort Gaines and a like distance from Fort Powell. On the morning of the 4th, troops moved to within 1,500 yards of Fort Gaines and took up position there to assist in the major naval assault scheduled for 5 August 1864.

Farragut's plan to capture Fort Morgan involved an innovative maneuver. He lashed his smaller wooden vessels to the west-ern side of his larger ironclad vessels. The idea was that the smaller vessels would be protected from the heavy fire and could act as tugs if the larger ships became disabled. Early on the morning of the 5th, Farragut began his assault. In a brief but intense skirmish, the Federal ships managed to get past Fort Morgan and into the bay. Within three hours the Confederate naval defense was eliminated. The chief Confederate support had consisted of the ram *Tennessee* and the gunboats *Gaines*, *Morgan*, and *Selma*. Within an hour or so of entering the bay, the *Gaines* and *Selma* were disabled. In another brief skirmish, the *Tennessee* was captured but the *Morgan* escaped.[21] Although the forts did not fall until later, the Union considered the Battle of Mobile Bay over.

Fort Powell also was taken on 5 August 1864, but only after it was abandoned by Confederate troops. The assault on Fort Gaines rendered the small fort useless and increased its vulnerability. The Confederate commander blew up Fort Powell the night of 5 August and escaped with his troops, first to Cedar Point on the mainland and from there to Mobile.

Fort Gaines surrendered on 8 August 1864, defenses there were weak compared to those at Fort Morgan.[22] The garrison at Fort Gaines had about 800 men and boys, none of whom had much, if any, experience in active combat. The surrender of the fort gave uninterrupted transit for shallow-draft Union vessels between Mobile Bay and New Orleans.

The siege of Fort Morgan was another matter. This structure was more substantial than Fort Gaines, better garrisoned, and more heavily armed. Union troops had to come ashore on Mobile Point from Bon Secour Bay, east of the fort. The soldiers encountered difficult terrain. It was sandy, low, swampy, and generally impossible for the animal teams to maneuver efficiently. Nonetheless, batteries were constructed for the field pieces to be used against the fort. The heaviest fighting began on 22 August 1864 and was waged from both the sand hills to the east of the fort and from the various ships in the bay. Eyewitness

Map 4-5. A map of defenses at the entrance to Mobile Bay showing Fort Morgan, Fort Gaines, and Fort Powell *(The Official Military Atlas of the Civil War).*

accounts indicate that Union fire was intense and accurate, and was met by little return fire from Fort Morgan. On 23 August a white flag was raised from the fort and surrender took place at that afternoon. With the fall of Fort Morgan, all of the Gulf fortification system was controlled by Federal troops.

Union attention now focused on the capture of Mobile, the result of which would be an end to Confederate blockade running in the Gulf of Mexico. Union officers intended to attack and take the city shortly after seizing Fort Morgan.

Pressing events in other parts of the southern campaign, however, postponed the attack on Mobile until early 1865. Hence, Mobile was under siege just as Lee was surrendering to Grant at Appomattox, and the formal surrender of the city came after the fall of the Confederacy.[23]

The Confederates abandoned one other important fortification, Fort *Massachusetts* on Ship Island, rather than allowing it to be seized by the Federals (Figure 4-2). Although the fort was critical to military operations in the Gulf, its strategic value was underestimated by the Confederacy in the early years of the war. It was abandoned after about six months of occupation.

The strategic importance of Ship Island was recognized by the earliest European explorers and colonizers along the Gulf coast. It was first sighted by some of d'Iberville's men in early 1699 and in 1701 a magazine and barracks were constructed on the island.[24] The development of New Orleans diminished Ship Island's strategic significance, and it passed into relative obscurity until the War of 1812 when Major General Edward Pakenham used it as a base of operations for the English assault on New Orleans.[25] The island once again saw little activity until engineers began construction of Fort Massachusetts as one of the links in the seacoast fortification system. When the Confederates took over the fort in 1861, construction was incomplete. After determining that the unfinished condition made it impossible to effectively use guns already placed there, the Confederates abandoned the fort and island in September 1861.

The decision on the future of the fort then shifted to the Federal government. Following a brief skirmish with a Confederate steamer in October 1861, the U.S. government decided to maintain the fort as a strategic link in its efforts to seal off Confederate operations. The fort was named after the U.S.S. Massachusetts, which had been involved in the skirmish. Had the Confederates maintained tighter control of Ship Island, lightning attacks by small boats against vessels might have bolstered Confederate control of the Mississippi Sound as well as the coastal area from New Orleans to Pensacola.

Figure 4-2. Fort Massachusetts, Ship Island, Mississippi Sound (Public Affairs, The District).

The Civil War, 1861-1865: Notes

1 Albert E. Cowdrey, *Land's End: A History of the New Orleans District, U.S. Army Corps of Engineers* (New Orleans, LA: U.S. Army Engineer District, 1977), p. 16; and Burns, Zed H., *Confederate Forts* (Natchez, MS: Southern Historical Publications, Inc., 1977), p. 12. An interesting account of Lieutenant Slemmer's refusal to turn Fort Pickens over to the Confederacy is told in an article by Brevet Lieutenant Colonel J.H. Gilmer, "With Slemmer in Pensacola Harbor," in Robert Underwood Johnson and Clarence Clough Buel, eds., *Battles and Leaders of the Civil War* (New York: The Century Company, 1884 1887), pp. 26 32. Colonel William H. Chase, pillar of the U.S. Army Corps of Engineers on the Gulf frontier for nearly three decades, asked Lieutenant Slemmer to surrender the fort. Colonel Chase had supervised the construction of Fort Pickens and other forts along the Gulf coast.

2 Leland R. Johnson, *Engineers on the Twin Rivers: A History of the Nashville District*, (Nashville, TN: U.S. Army District, 1978), p. 81, hereafter cited as *Engineers on the Twin Rivers*; see also James L. Nichols, *Confederate Engineers*, (Tuscaloosa, AL: The University of Alabama Press, 1957); Philip M. Thienel, "Engineers in the Union Army, 1861 186 5," *Military Engineer*, 47 (January 1955): 36 41, and 47 (March 1955): 110 115; William M. Robinson, Jr., "The Confederate Engineers," *Military Engineer*, 22 (July 1930): 297 305, 22 (September 1930): 410 419, and 22 (November 1930): 512 517; U.S., War Department, *The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies* (Washington, DC: GPO, 1880 1901); U.S., Congress, House, "On the Necessity of an Increase of the Engineer Corps and Topographical Engineers Exclusively for Military Purposes," *American State Papers, Military Affairs*, Vol. 4 (1828 1832), No. 463, p. 630. An especially thorough treatment of the paucity of qualified Engineer officers and the excessive burden borne by the Corps of Engineers is found in Chapter III, "Getting Down to Work," in Forest G. Hill, *Roads, Rails and Waterways: The Army Engineers and Early Transportation* (Norman, OK: University of Oklahoma Press, 1957), pp. 57 95.

3 *Engineers on the Twin Rivers*, p. 81.

4 The authoritative biography of Beauregard is T. Harry Williams' *P. G. T. Beauregard: Napoleon in Gray*, (Baton Rouge, LA: Louisiana State University Press, 1955). Beauregard, the product of a wealthy Louisiana planter family, broke with tradition and made the military a career. He was appointed to West Point and in 1838 graduated near the head of his class. He was assigned to Fort Adams in Newport, Rhode Island (a prestigious assignment reserved for the academy elite), but was transferred to Pensacola for health reasons in 1839. He saw distinguished service in the Mexican War, and for an extended period was responsible for fortifications in what the Engineer Department called "the Mississippi and Lake defences of Louisiana." This covered other fortifications in the Gulf frontier and accounts for Beauregard's responsibilities at Fort Gaines. He also served as Superintendent of West Point for one day, the shortest term on record. After President Buchanan removed him from the superintendency as a political rebuke, he resigned from the Corps of Engineers. He was appointed Brigadier General in the Confederate Corps and was assigned to Charleston. While there, Beauregard fired the first shots on Fort Sumter that led to the formal declaration.

5 RG 77, Entry 127, Engineer Circulars and Orders, 1811 1866. Engineer Order No. 25, Washington, Engineer Department, 27 November 1848, p. 158.

6 James L. Nichols, "Confederate Engineers and the Defense of Mobile," *The Alabama Review*, 12 (July 1959): 182. Captain Leadbetter had resigned his Corps commission in 1857 to become Chief Engineer for the State of Alabama. When the war broke out, he was assigned as Chief Engineer to Colonel (later General) William J. Hardee, who was in charge of Fort Morgan. Leadbetter was succeeded by Captain Samuel H. Lockett, another distinguished graduate of West Point. Lockett graduated at the top of his class in 1859 and had been assigned to Pensacola.

7 ibid., p. 185.

8 ibid., p. 182.

9 *Historic Structure Report, Fort Pickens*, 1821-1895, p. 484.

10 Edwin C. Bearss, *Historic Resource Study, Ship Island, Harrison County, Mississippi, Gulf Is-lands National Seashore, Florida/Mississippi* Washington, DC: National Park Service, 1984), p. 49. Hereafter cited as *Historic Resource Study, Ship Island.*

11 *Historic Structure Report, Fort Pickens*, 1821-1895, p. 512.

12 James L. Nichols, *Confederate Engineers* (Tuscaloosa, AL: Confederate Publishing Co., Inc., 1957), p. 62.

13 A.H. Burnham, Bvt. Maj., "Operations Against the Defences of Mobile, in the Late War," *Printed Papers of the Essayons Club of the Corps of Engineers*, Vol. I (Willet's Point, New York Harbor: Battalion Press, 1868-1872), p. 1.

14 John C. Watson, "Farragut and Mobile Bay - Personal Reminiscences," *Military Order of the Loyal Legion of the United States* (Washington, DC: [By the Order], 1916), p. 6.

15 Ibid.

16 Christopher Columbus Andrews, Brevet Major General, *History of the Campaign of Mobile; Including the Cooperative Operations of Gen. Wilson's Cavalry in Alabama* (New York: D. Van Nostrand, 1867), p. 10. Andrews is basing his statement on Mobile's defenses on assessments of Confederate General Joseph E. Johnston.

17 Ibid., pp. 10 11.

18 Ibid., p. 11.

19 A detailed analysis of the Confederate obstructions can be found in Jack B. Irion and Clell L. Bond, *Identification and Evaluation of Submerged Anomalies, Mobile Harbor, Alabama* (Mobile, AL: U.S. Army Engineer District, by Espey, Huston & Associates, 1984), Doc. No. 84066. I have relied on a companion document by the same authors, *Archaeological Testing of the Confederate Obstructions, 1Mb28, Mobile Harbor, Alabama* (Mobile, AL: U.S. Army Engineer District, by Espey, Huston & Associates, 1985), Doc. No. 85036.

20 The major events in the capture of the forts guarding Mobile Bay are extracted from Brevet Major A. H. Burnham's paper on the Mobile campaign read before the Essayons Club on 4 May 1868. Burnham was a Union officer involved in the campaign. See Burnham's "Operations Against the Defences of Mobile, in the Late War," *Printed Papers of the Essayons Club of the Corps of Engineers*, Vol. I. Unless otherwise cited, all details of the campaign are from this eyewitness account.

[21] Alfred H. Guernsey and Henry M. Alden, *Harper's Pictorial History of the Civil War* (New York: Harper & Brothers, 1868), p. 747. Facsimile reprint by the Fairfax Press, a Division of the Imprint Society, Inc. Distributed by Crown Publishers, Inc.

[22] Fort Gaines was not completed prior to the Civil War, and the Confederate occupation of the fort did not prompted any appreciable completion of the remaining work. Therefore, when it was assaulted by Union troops, there was little reason to believe the fort would be difficult to take.

[23] Nichols refers to the fall of Mobile as resulting from the *de facto* fall of the Confederacy. See *Confederate Engineers*, p. 76.

[24] Dunbar Rowland, *History of Mississippi: Heart of the South*, Vol. I (Chicago, IL: S.J. Clarke Publishing Company, 1925), p. 188.

[25] Burns, Zed H., *Confederate Forts* (Natchez, MS: Southern Historical Publications, Inc., 1977), p. 43. Unless otherwise noted, the summary of Fort Massachusetts is taken from Burns' work.

Part 2 - The River and Harbor Era, 1865-1918

V. The Mobile District Office and Formation of the District

Following the brief interlude brought about by the Civil War, Engineers once more were assigned to responsibilities in the Gulf coast region. The general orders indicate that the Mobile District was established in 1888 in a formal reorganization of operations at the national level. Between 1815 and 1870 Mobile was used infrequently as an Engineer base; after 1870 Engineers were assigned routinely to the city.[1] For most of the antebellum period, however, most Gulf frontier engineering projects were directed from New Orleans and Pensacola.

Minor civil operations involved surveys, removal of obstructions from rivers, and examinations (in the early decades of the nineteenth century these focused on the feasibility of connecting interior river basins with coastal markets and ports through a network of canals).

The British assault on the United States during the War of 1812 revealed the country's vulnerability to attack from superior naval forces. Consequently, in the decades between the War of 1812 and the Civil War, Corps operations everywhere were more often focused on securing the nation militarily; civil works projects were second in priority.

The Gulf frontier was considered a vulnerable zone. Construction of seacoast fortifications was the primary mission of Engineers between 1815 and the beginning of the Civil War. Operations were directed from several locations including New Orleans, Mobile Point at the entrance to Mobile Bay, and Pensacola.[2] Occasionally, an Engineer officer assigned to a specific project on the Gulf would be reassigned temporarily to examine and survey some river basin far removed from the Gulf.[3] In these instances, his duties were redesignated to subordinates or to officers temporarily secured from other duty posts. Frontier conditions required Engineer officers to be flexible.

Federal operations resumed in the Gulf after the Reconstruction period. An Engineer office was opened in Mobile in 1870.[4] The opening of this field office may have been connected to the resumption of navigation improvements to Mobile Harbor and Bay. In 1866 Colonel William E. Merrill completed a major examination of Confederate obstructions in the harbor that would have to be removed before commercial redevelopment of Mobile could resume.[5] A sum of $50,000 was appropriated in 1870 for improvement of Mobile Harbor, the first such appropriation since 1857. Major Chauncey B. Reese was in charge of operations, which consisted of removal of obstructions and dredging of the main shipping channel.[6]

Serious differences between Congress and the Corps over management style and accountability led to strained relations. Following the Civil War, Congress was determined to reduce military presence to the minimum level necessary for the Army to fulfill such missions as building coastal fortifications, training military officers, and controlling Native Americans.[7] Congress's negative attitude was reflected as well in appropriations, and cutbacks caused a Corps manpower shortage throughout the 1870s.[8]

The shortage of qualified officers to supervise corps projects persisted throughout the last quarter of the nineteenth century. The increasing responsibility for river and harbor improvements, the hostile attitudes of both Congress and private engineers (who felt the Army had relegated them to second-class professional status), and internal changes in the

Army structure resulted in organizational changes within the Corps from the Office of the Chief of Engineers (OCE) down to the field offices.[9] In the years immediately following the Civil War, the Corps failed to settle on an efficient method of monitoring its expanding civil works mission. In 1866 the OCE established four Divisions for handling routine reports from the field. In 1867, these Divisions were reduced to three, only to be later returned to four. In 1869, the Divisions were expanded to five. They were reduced to three in 1871, and expanded once again to five in 1874.[10] The changes may have been associated with the Corps' significant increase in river and harbor project responsibility throughout the last quarter of the nineteenth century.[11]

The increased workload made monitoring work in the field difficult for headquarters. Consequently, during the last quarter of the century, OCE developed Divisions and Districts to oversee civil works projects. An officer assigned to the field became responsible for a number of works in the same geographical area and was designated as District Engineer.[12] Although officers were assigned to specific areas, as was the case with Mobile following the Civil War, no evidence exists of a formal administrative structure referred to as a "District."

After 1880 specific areas started to be identified as Districts. The first District maps indicating the location of all public works, examinations, and surveys supervised by a District Engineer were ordered by OCE in 1887.[13] In line with the national reorganization in 1888, orders from the Adjutant General's office in November authorized the Chief of Engineers to assign as many officers as necessary, not below the rank of lieutenant colonel, as Division Engineers. The geographical makeup of Divisions was left up to the Chief of Engineers.[14] The Secretary of War authorized the Chief to designate Divisions, an act that became official in General Orders of 3 December 1888. The Chief established five Divisions; Mobile was placed in the Southwest Division under the supervision of Colonel Cyrus B. Comstock. Major Andrew N. Damrell was assigned as District Engineer in Mobile (Figure 5-1). The territory assigned to Montgomery was also under Comstock; Captain Philip M. Price was made District Engineer.[15]

The Southwest Division included territory under the supervision of seven District Engineers. By 1901 the Southwest Division, which included the Mobile and Montgomery Districts, was renamed the Gulf Division.[16] At the same time, some territory was added (District operations centered in Little Rock, Arkansas) while other territory was dropped.[17]

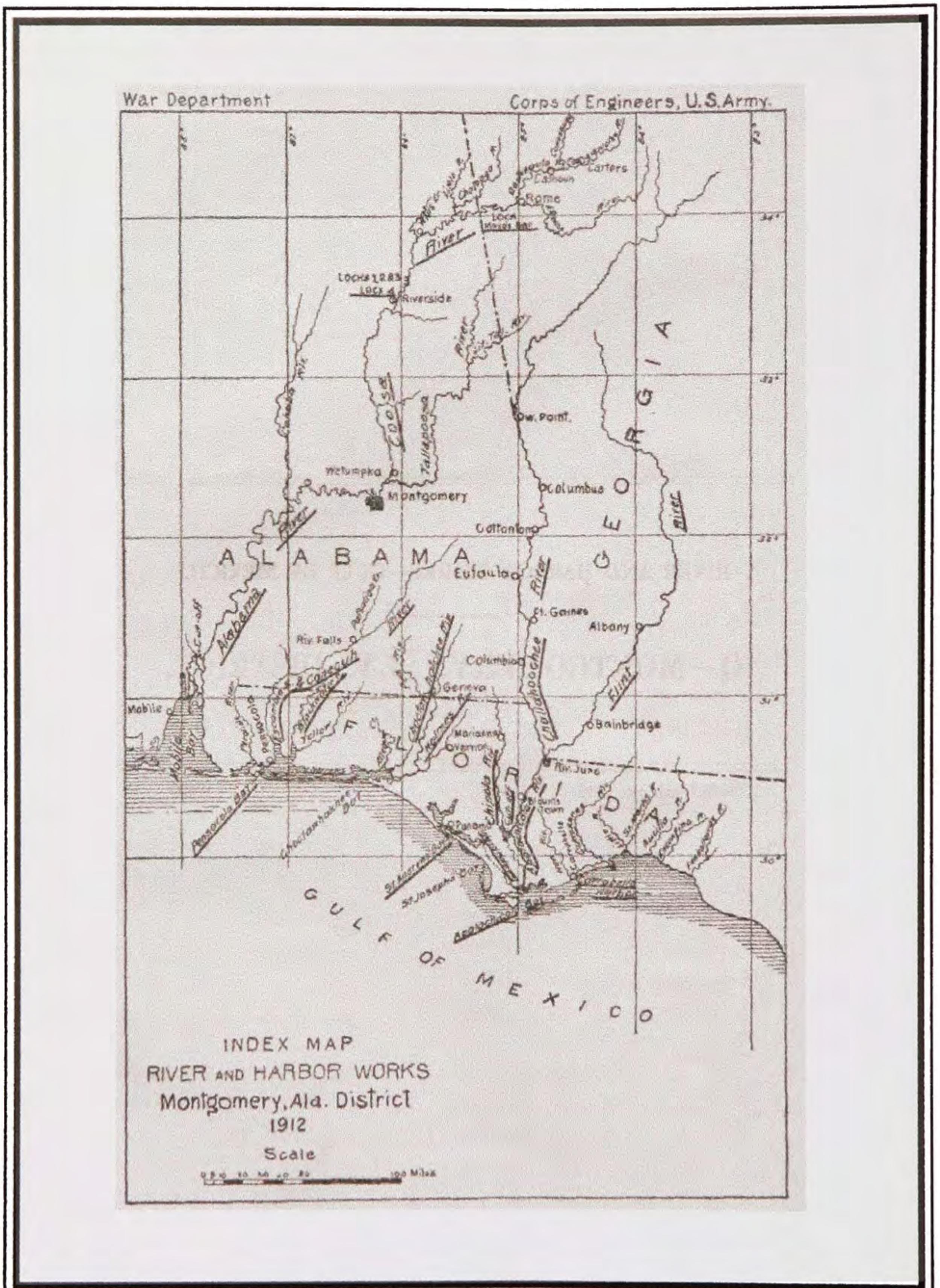
The combined territories of the Mobile and Montgomery offices eventually formed the core of the present Mobile District. In 1912, the Corps published a cumulative index covering the period 1866 to 1912. Reference maps in the index and information included in reports imply that the Districts, as mapped in 1912 (Maps 5-1 and 5-2), contained the same river basins as shown on OCE maps in 1887, and when the Corps was formally organized in 1888.[18]

All streams forming the watershed of a particular river system were assigned to a Division for supervision. Division responsibilities were further subdivided among Districts, which could more efficiently manage projects within a smaller geographic context than could the Division. In addition, Division Engineers had specific duties different from District Engineers and were senior officers with considerable experience, broad perspective, and management ability.[19] District boundaries for civil works are still based on river basins, an arrangement that has changed little since 1888.

The Corps' system of distributing workload may have resulted from river and harbor legislation. Projects were assigned by rivers, beginning with harbor improvement. Territorial

Figure 5-1. Portrait, Colonel Andrew N. Damrell, District Engineer, 1870, 1873-1895 (Public Affairs, MDO).

Map 5-1. Index map of the Mobile District, 1912 *(ARCE)*.



Map 5-2. Index map of the Montgomery District, 1912 *(ARCE)*.

responsibilities expanded as more projects and operations were assigned farther upstream and along major tributaries. Eventually, inefficiencies related to distance and lack of personnel restricted the number and location of projects assigned to any one Engineer. Hence, a river basin approach to assigning District projects evolved.

Two Districts were created in 1888 within the territory now under Mobile's supervision. The Montgomery District encompassed the major watersheds of the Alabama Coosa Tallapoosa Rivers and the Apalachicola Chattahoochee Flint Rivers. Smaller rivers included the Choctawhatchee, Chipola, Conecuh, and Escambia. In addition to the rivers, improvement of Pensacola, St. Andrews, and St. Joseph's Bays and Carrabelle Harbor was included. The District was responsible as well for portions of the Gulf Intracoastal Waterway. The District's operations extended from Fenholloway River in the eastern Florida panhandle to Perdido Bay in the west, and from the Gulf of Mexico inland nearly 350 miles to the vicinity of Rome and Cartersville, Georgia.

The Mobile District included the watershed of the Tombigbee, Black Warrior, and Warrior Rivers in Alabama, and the Leaf and Pearl Rivers in Mississippi. Coastal operations included improvements to various ports in the Mississippi Sound including Pascagoula, Biloxi, and Gulfport. The District's territory extended from Mobile Bay in the east to the Pearl River system on the Mississippi and Louisiana state line in the west. Inland, the territory extended northward through much of western Alabama and eastern Mississippi to close to the Tennessee state line.

Districts that formed around the Mobile Montgomery Districts include the Jacksonville District to the east of the Fenholloway River in Florida, the Savannah District to the east of the Apalachicola Chattahoochee Flint system in Georgia, the Nashville District from the Tennessee River Valley northward, the New Orleans District to the west of the Pearl River, the Vicksburg District to the west of the Pearl River in central Mississippi, and the Memphis District to the north and northwest of the Tombigbee River in Mississippi.

Periodic changes were made in District boundaries by the shifting of responsibilities for a portion of a basin from one District to another. For example, in 1948 the boundary between the New Orleans and Mobile Districts was redefined.[20] The boundary from the Rigolets to the Gulf of Mexico was altered so that the new boundary would follow a line along the westerly watershed line of the Pearl River basin to the north bank of the Rigolets. From there specific instructions were given for redrawing the line between islands, to certain land points, and eventually by specific coordinate bearings into the Gulf of Mexico. All records pertaining to the area would be transferred to the newly assigned District. Occasionally, Districts would be merged to maximize operational efficiency. The Montgomery District was consolidated with the Mobile District effective 30 September 1933.[21]

1 An engineer office was in Mobile as early as 1848, but its precise location is unknown (see *Mobile District History*, p. 41). Beauregard also used Mobile as a base of operations while he was briefly in charge of construction at Fort Morgan. It is not known, however, whether he established an office or merely chose to live in Mobile rather than on Mobile Point.

2 Albert E. Cowdrey, *Land's End: A History of the New Orleans District, U.S. Army Corps of Engineers* (New Orleans, LA: U.S. Army Engineers District, 1977), pp. 11 13.

3 At one point while in charge of the Gulf fortifications, Chase was ordered to conduct an examination of the Red River in Texas and Louisiana. Contents of *Annual Reports* occasionally include summaries of assignments completed outside the immediate geographic area of an Engineer's responsibilities. The actual orders can be read in the correspondence files of the Corps of Engineers, National Archives, RG 77, Washington, DC.

4 *Davis, Mobile District History*, pp. 41, 51. Although Davis' history does not cite sources for establishment of the office, some minimal corroboration of the fact exists in the Correspondence of Office Divisions, 1865 1870, Library of the Chief of Engineers, Washington, DC. A note in those files states that an Engineer office was opened in Mobile in October, 1870. No additional information was available. The District Office address that Davis cited for 1870 (the corner of Commerce and Dauphin streets) cannot be verified. The later addresses: in 1890 at the northwest corner of Dauphin Street at Royal, a later site at 150 St. Francis Street, Rooms 30 36 of the Young Men's Christian Association in 1905, and at 352 Government Street in the Lowenstein House in 1918 are based on information from Mobile city directories. Copies of these directories are in the Mobile City Library.

5 William E. Merrill, *Report on the Present Condition of the Harbor of Mobile*, Manuscript on file, National Archives, Washington, DC. This citation is taken from Davis, *Mobile District History*.

6 U.S., Congress, House, *Index to the Reports of The Chief of Engineers, U.S. Army (Including the Reports of the Isthmian Canal Commissions, 1899-1914): 1866-1912*, H. Doc No. 740, 63d Cong., 2d sess., Vol. I, Rivers and Harbors, pp. 648-649. Hereafter cited as *Index to the Reports*. See also U.S., Congress, Senate, *Laws of the United States Relating to the Improvement of Rivers and Harbors from August 11, 1790, to March 3, 1887, with a Tabulated Statement of Appropriations and Allotments*, Misc. S. Doc. 91, 49th Cong., 2d sess., p. 165. Hereafter cited as Laws, 1790-1887.

7 Janet A. McDonnell, "An Administrative and Organizational History of the U.S. Army Corps of Engineers, 1865-1902," unpublished draft manuscript on file, Office of History, Headquarters, U.S. Army Corps of Engineers, 1986, pp. 57-58. Permission to quote from this source was provided by the Office of History, OCE. Hereafter cited as "Administrative and Organizational History."

8 Ibid., p. 59.

9 Ibid., p. 73.

10 McDonnell covers the organizational shifts well in her manuscript on the Corps' administrative history (see pages 76-77). Although voluminous, the General Orders and Circulars for various years as contained in NA, RG 77, illustrate how rapidly changes occurred.

11 This viewpoint is corroborated by McDonnell (see page 77).

12 McDonnell, "Administrative and Organizational History," p.82.

13 Ibid., p. 83.

14 *Regulations of the Army of the United States and General Orders in Force*, (Washington, DC: GPO, 1881). See regulations 2475 1/4 and 2475 1/2. This is the same as General Order No. 93, Adjutant General's Office.

15 Chief of Engineers, General Order, No. 12, 3 December 1888.

16 The creation of the Montgomery District coincided with that of the Mobile District in 1888. Although boundaries, and even Districts, are not named in the General Order from OCE, the names of the District Engineers are. Major Damrell is well known as the District Engineer associated with Mobile. Captain Price had responsibilities for rivers in the central and eastern river basins of Alabama, which would indicate he had been placed in charge of them at the same time Damrell was assigned to Mobile. An unpublished document provided by the Mobile District Office, entitled "Geographical Organization of SAD," erroneously cites creation of the Montgomery District as 1910. McDonnell indicates that the Montgomery District was mentioned in 1901 in General Order No. 7, 24 July 1901, OCE.

17 The procedure of realigning Districts is still in effect as portions of the Mobile District covering the Pearl River basin were recently transferred to the Vicksburg District.

18 *Index to the Reports, 1866-1912*, pp. 610, 645.

19 McDonnell, "Administrative and Organizational History," p. 85.

20 General Order No. 1, 12 January 1948, OCE.

21 General Order No. 6, 6 October 1933, OCE.

VI. The Eastern River Basins, 1865 - 1918

After the Civil War, the nation turned toward rebuilding the economy. Developing the nation's transportation system became a positive, tangible means of measuring progress. The desire to expand commerce and to enhance the United States' position in the industrial world was partially manifested in the passage of annual rivers and harbors legislation.

Increased national prosperity in the decades following the Civil War rekindled pressure on Congress to fund internal improvements. Only a body as large as the Federal government was believed capable of financing the huge expenditures needed for river and harbor projects. Over time, the congressional funding process focused on setting priorities, not debating whether the government would or would not underwrite improvements. The Corps continued to be responsible for examinations, surveys, and recommendations to Congress relative to the feasibility of projects. The Corps also was tasked with the design, construction, and maintenance of various internal improvement projects.

The Survey Process

Examinations and surveys authorized in the annual rivers and harbors bills were similar in nature. For each river basin, the Corps collected basic data in preliminary examinations. Initially, Engineers conducting the surveys, and later District Engineers, were charged with determining the feasibility and cost of any proposed project. The Supervising Engineer used the survey data to prepare a detailed report that was forwarded to the Chief of Engineers. The report included recommendations for improvement along particular rivers. The Chief of Engineers then used the myriad reports to write an *Annual Report* to Congress, submitted through the Secretary of War.

The *Annual Report* summarized all funded work accomplished since the previous appropriation and recommended additional funds to complete ongoing projects or to initiate new ones. Because the Chief had to rely on the detailed work accomplished by his District Engineers, their project recommendations carried considerable weight in the report submitted for congressional review and action.

Geology was an important consideration in the surveys; knowledge of the physical terrain where navigation projects would be constructed was vital. Commercial statistics were important in the justification of any project because benefits were to accrue at both the local and national levels. Information was collected on channel soundings, water velocity, channel obstructions (such as bars, snags, and rapids), and the frequency of obstructions.

Examinations and surveys had distinct characteristics. Examinations were conducted to provide information on the general feasibility of a particular project. Surveys were done to determine the precise obstacles to be removed, altered, or bypassed and involved more detailed information about the cost of improvements. Provided the preliminary examination for navigation or harbor improvements was favorable, Congress was likely to authorize funds for a survey. If the follow-up survey was successful, appropriations would be sought to construct the project.

The length of time from preliminary examination to completed project was protracted, and some partially completed projects were abandoned as too expensive. The Coosa River improvements, for example, were aborted as too costly after years of examinations and surveys. Conversely, some projects were carried through based on the time, effort, and public monies expended (the Tennessee Tombigbee Waterway is a case in point).

Congress regularly appropriated funds for major examinations and surveys within the territory that now comprises the Mobile District. Beginning in the 1870s, funds were approved for examination of the Coosa, Alabama, Tombigbee, Warrior and Black Warrior, Chattahoochee, Flint, and Apalachicola Rivers. In addition, examinations and improvements to Mobile, Pensacola, Biloxi, and other Gulf ports were approved. Obstructions in harbors and rivers all along the Gulf were removed, channels were dredged, and sandbars blocking river mouths were removed. The number of surveys and projects attest to the magnitude of river and harbor improvements. By the end of the first decade of the twentieth century, the Mobile District was involved in over 95 surveys and 300 operational activities of various kinds. The Montgomery District had taken part in some 147 surveys and an additional 300 operational activities. The combined efforts of the two Districts, therefore, involved nearly 250 surveys and 600 operations over 40 years.[1]

The eastern river basins include two major drainage systems and a number of smaller streams and rivers, most of which flow into the Gulf of Mexico between Perdido Bay in the west and St. Marks River in the east (see Map 5-2). The dominant basin is the Alabama Coosa drainage system. Major tributaries include the Oostenaula and Etowah rivers in northwest Georgia, which join at Rome, Georgia, to form the Coosa River. The Coosa River in turn flows to the southwest across eastern Alabama. Its major tributary is the Tallapoosa River, which joins the Coosa between Wetumpka and Montgomery to form the Alabama River. A minor tributary to the Alabama is the Cahaba River, which enters the Alabama just below Selma. The Alabama forms part of the Mobile River, which empties into Mobile Bay.

The second major river basin is fed by the Chattahoochee, Flint, and Apalachicola Rivers. The Flint is a major tributary to the Chattahoochee, joining the latter at the Georgia Florida border to form the Apalachicola River. That river empties into the Gulf of Mexico at Apalachicola Bay. The Chipola River also flows into Apalachicola Bay. Elsewhere in the eastern area, a number of small river systems originating in the low hills of the southern Alabama coastal plain flow southward to the Gulf, entering that water body through small bays and inlets in the embayed coastline of the Florida panhandle. Of these, the Escambia and Conecuh Rivers are the largest and flow into Pensacola Bay. Farther to the east, the Choctawhatchee River flows into the bay of the same name.

The Coosa River Basin

The Coosa was the largest river basin slated for improvement in the District. Although interest in developing the Coosa River began in the early 1820s, no significant Federal funds were appropriated for navigation projects until after the Civil War. The state of Alabama considered the river significant to the region's economic development, and nearly $2.5 million was appropriated for its improvement between 1870 and 1912.[2]

In the early 1820s, Alabama petitioned Congress for assistance in connecting the Coosa River with the Tennessee River. The project would link the economic prosperity of eastern Tennessee and the nation's interior with the growth anticipated for Alabama. Funneling trade from the Tennessee Valley southward via the Coosa and Alabama Rivers to the port of Mobile was viewed as a means of achieving the economic objective.

Although Congress in 1824 approved an act to join the Tennessee and Coosa rivers, specific funding recommendations were not formulated until 1828. In that year, Congress granted the Alabama legislature the right to sell 400,000 acres of surplus Federal land in the state. Money from the land sales was to be used for navigation improvement on a number of Alabama rivers. Improvement of the Tennessee at Muscle Shoals was to have first priority, followed by the Coosa. However, the project was beset with problems at the outset. Land speculation after the initial rush to settlement in 1819 resulted in overvalued lands that the state could not sell. Abundant and cheaper land was available farther west in Arkansas and Texas. In 1830, Congress was again studying Alabama land sales as a means to finance the state's internal improvements.[3] However, the lands could not be sold and no action was taken to improve the Coosa or any other Alabama river through land sales. In 1837 and 1839, the state appropriated small amounts of capital from the "three percent fund" for improving the Coosa.[4] During these years, over $135,000 was expended on river improvements, but no permanent improvements were accomplished because of limited funding. The Coosa River project was allotted $60,000. The Tombigbee and the Black Warrior received $25,000 and $20,000, respectively.[5] A surplus in the fund of more than $400,000 was later used to subsidize railroad development.

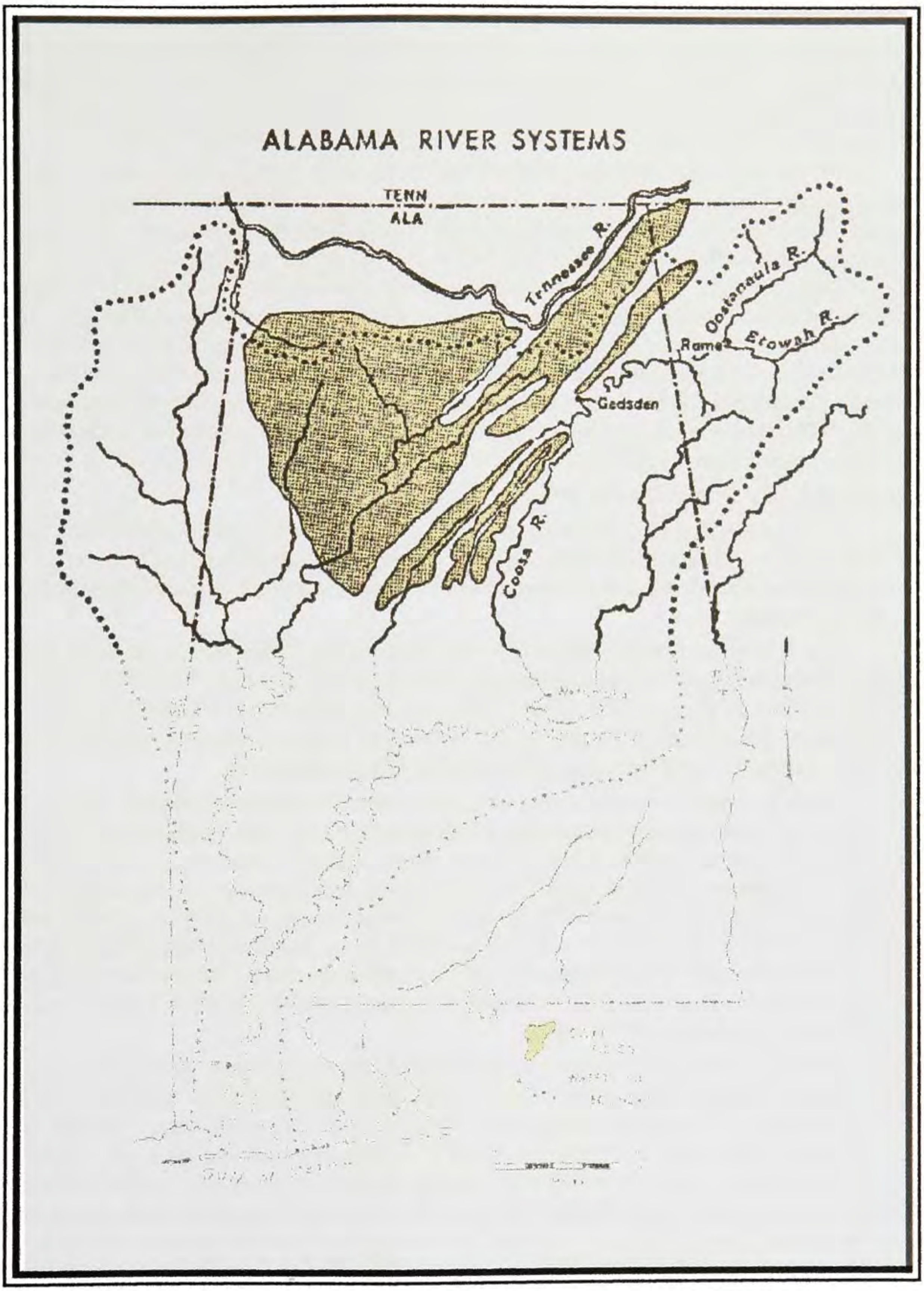
In 1870, Congress authorized an examination or survey, or both, to be made on the Coosa River.[6] An Engineer office was reopened in Mobile, the first since antebellum times, so that operations in Mobile Bay and river surveys in Alabama could be supervised from that location. The new Engineer office eventually became a District office when Alabama was divided into two areas of Corps responsibility; it later became headquarters for the much larger District that exists today.

Major Chauncey B. Reese, Supervising Engineer, appointed Henry C. Fillebrown to conduct the Coosa River survey. Fillebrown received his final instructions in Mobile in August 1870 and proceeded to Wetumpka, north of Montgomery, Alabama, to make final preparations; the examination and survey commenced in September.[7] Unfortunately, Reese died of yellow fever that same month. He was replaced by Captain Andrew N. Damrell, who was succeeded in December 1870 by Colonel J. H. Simpson. Damrell returned to Mobile in 1873 as the District Engineer and served with distinction in that capacity for 22 years, longer than any other officer.

The 1870 Coosa River survey was undertaken to determine the feasibility of linking steamboat travel on the upper and lower Coosa. Connecting the two reaches would provide a 330-mile navigation corridor from Wetumpka, Alabama, to Rome, Georgia; steamboat travel from Mobile to Rome also would be possible. After massive coal deposits were discovered in the upper Coosa Valley, both state and Federal officials expressed interest in improving the Coosa River. A potential iron industry in Alabama made the development appealing to local and national interests (Map 6-1).[8] A survey was made from Wetumpka to the Selma, Rome, and Dalton (SR&D line) Railroad Bridge near Wilsonville, Alabama, a distance of 68.5 miles. Examination of the river from the bridge to Greensport, Alabama, an additional 70 miles also was completed. The instrument survey demonstrated the feasibility of a navigation channel from Wetumpka to the SR&D Railroad bridge; the examination suggested a system of improvements by which boats drawing three feet of water could run between Greensport and the railroad bridge at low water.

Fillebrown's Coosa River Survey

Fillebrown, an independent civil engineer was to survey the river from Wetumpka to Greensport. Aside from the 150 miles of regular steamboat navigation between Rome, Georgia, and Gadsden, Alabama, the Coosa was navigable for an additional 30 miles downstream from Gadsden to Greensport. However, steamboat companies did not consider business demand between Gadsden and Greensport sufficient to warrant regular service.



Map 6-1. Alabama River systems and coal fields (Drawn by author, 1981).

According to pilots and boatmen, the Coosa was navigable from its mouth to Wetumpka whenever the Alabama River was navigable from Mobile to Montgomery, which it usually was. The expectation was that opening the stretch between Wetumpka and Greensport would make the 30 miles from Greensport to Gadsden economically feasible as the connecting stretch between the upper and lower portions of the river basin.

Fillebrown's detailed report outlined the obstructions in the Coosa's channel, which were primarily shoals and gravel bars. The river cut through the Piedmont, the gently rolling uplands between the Gulf coastal plain and the Appalachian mountains, and shoals were common. Fillebrown recommended dredging a channel with a minimum depth of 3.5 feet at low water, adequate at that time for fully laden steamboats. A series of dams and locks, constructed at intervals, would slow the current and create calm water for navigation. The result would be slackwater navigation. Fortunately, the survey revealed an abundance of limestone in the vicinity that could be used for lock construction. Long-leaf pine, oak, and other timber suitable for dams, crib work and general construction needs could be obtained readily. The estimated cost for improving the Coosa River from Greensport to the SR&D Railroad bridge exceeded $278,000.[9]

Long's Survey of the Coosa River

This survey began in early fall but was suspended at the end of December 1870 because of heavy rain and high water. Fillebrown returned to Mobile, where he reported on the work accomplished. He was reassigned to other duties in the territory, including surveys on the Tombigbee.

The following season, Fillebrown was back on the Coosa River. In June 1871, Major Walter McFarland replaced Simpson as Supervising Engineer. McFarland was on the Coosa River in August 1871 when Fillebrown was drowned in a boating accident at Devil's Race. McFarland was suddenly left without an Engineer assistant, and the survey had to be suspended until he could secure a dependable replacement.

James C. Long, a civil engineer with experience on the Muscle Shoals surveys on the Tennessee River, was chosen to replace Fillebrown. At the time, Long was involved in a survey investigating connection of the Coosa River with the Tennessee. Since Long had to finish that assignment before reporting to McFarland, the Coosa survey was delayed until the following season.[10] Long essentially retraced Fillebrown's survey of the previous season. While he offered no radically new recommendations, Long discovered that Fillebrown had underestimated the cost of improvements. McFarland had increased Fillebrown's $278,484 estimate by an additional $139,242, for a total of approximately $418,000.[11] Long estimated the same work would cost $470,668.[12]

In the meantime, McFarland was busy making his own estimate of the Coosa River improvements between Wetumpka and the SD&R Railroad bridge. He determined that 29 locks would have to be built.[13] Each lock, constructed of crib work, was to be 200 feet between miter sills and 40 feet wide and would have masonry head and tail walls. Channel improvements would consist primarily of excavating through rock shoals to produce a uniform three-foot-deep channel for navigation. Total cost for the dams, locks, canals, and excavations to create a clear channel between Wetumpka and Greensport was estimated at $1.9 million. In all, McFarland's and Long's estimates, including McFarland's estimate for improving the section between Wetumpka and the railroad bridge, totaled nearly $2.4 million. The improvement of the 140 miles between Wetumpka and Greensport, despite the project cost, was the key to opening 700 miles of navigable stream between Rome, Georgia and Mobile, Alabama.[14]

Other Coosa River Surveys

Other surveys were performed periodically on the Coosa. Legislators, entrepreneurs, and Army engineers all viewed the nearby coal fields and the rise of Alabama's steel industry as a basis for the anticipated economic development of the basin.[15] Also, many believed that introducing commercial navigation would attract settlers to the areas bordering the river.

In 1874, an examination of the Coosa River between Gadsden and Rome included a recommendation for one lock and the excavation of a channel 4 feet deep and 80 feet wide.[16] A resurvey of a portion of the Coosa below Greensport was authorized in 1878. The survey was conducted between Whistenants and Ten Islands Shoals by R. C. McCalla under the supervision of Colonel W. R. King and Captain W. L. Marshall.[17]

McCalla's survey recommendation amended the lock size (to accommodate the steamboats then navigating the river) and proposed a different technique for lock construction. Whereas earlier locks were built of stone (Figure 6-1), the new locks would be part masonry, part cement, part cut stone, and part rubble. The new lock size was 210 feet between the miter sills and 40 feet wide.[18] Eventually more than 30 locks were proposed for the improvement of the Coosa. The three locks proposed by McCalla were later constructed (Map 6-2). Aside from the lock at Mayo's Bar and one near Broken Arrow Shoals, McCalla's proposed locks were the only ones fully completed. A lock at Wetumpka (Lock No. 31) was partially completed.

Another major survey of the Coosa River was done in 1879. Damrell, now in charge of the Mobile office, appointed Gavin B. Yuille to conduct a survey from Wetumpka to the foot of the Tuck a league Shoals, and from there to the East Tennessee, Virginia, and the Georgia Railroad bridge (formerly the Selma, Rome, and Dalton Railroad). Yuille recommended the construction of 31 locks, each 210 feet by 40 feet. The total estimated cost for the locks, dams, dikes, and rock excavation exceeded $2.6 million.[19] Although estimates for improvement of the Coosa River system ran into the millions, numerous rivers and harbors bills had appropriated barely $500,000 by 1880. Despite the limited funds, however, the river between Greensport and Rome was placed in fairly good boating condition for all seasons. The three locks and dams at Whistenants and Ten Islands Shoals (see Map 6-3) were nearly complete, and minor work had begun on a fourth lock at Broken Arrow Shoal. The Broken Arrow Shoal lock was completed but at increased cost and considerable delay.

Actual costs for improvements exceeded estimates. Annual reports of the Supervising Engineers from 1880 to 1888 explained that the increased costs were based on improved construction techniques. Locks were built of masonry laid in cement, with cut stone for the inner faces of both side walls. Some of the increased costs were attributed to the cost of foundation construction, and to higher prices for building stone, labor, and other materials.[20]

The Firth Survey

The formal organization of the Mobile and Montgomery Districts in 1888 did not have an obvious effect on rivers and harbors legislation. Surveys and operations continued to be approved and funded through congressional appropriations in Rivers and Harbors bills. Each District, however, now had an Engineer office and District Engineer assigned to supervise operations within a specified territory.

Another major survey of part of the Coosa River was authorized in the Rivers and Harbors Act of August 1888. Captain Philip M. Price was head of the Montgomery District

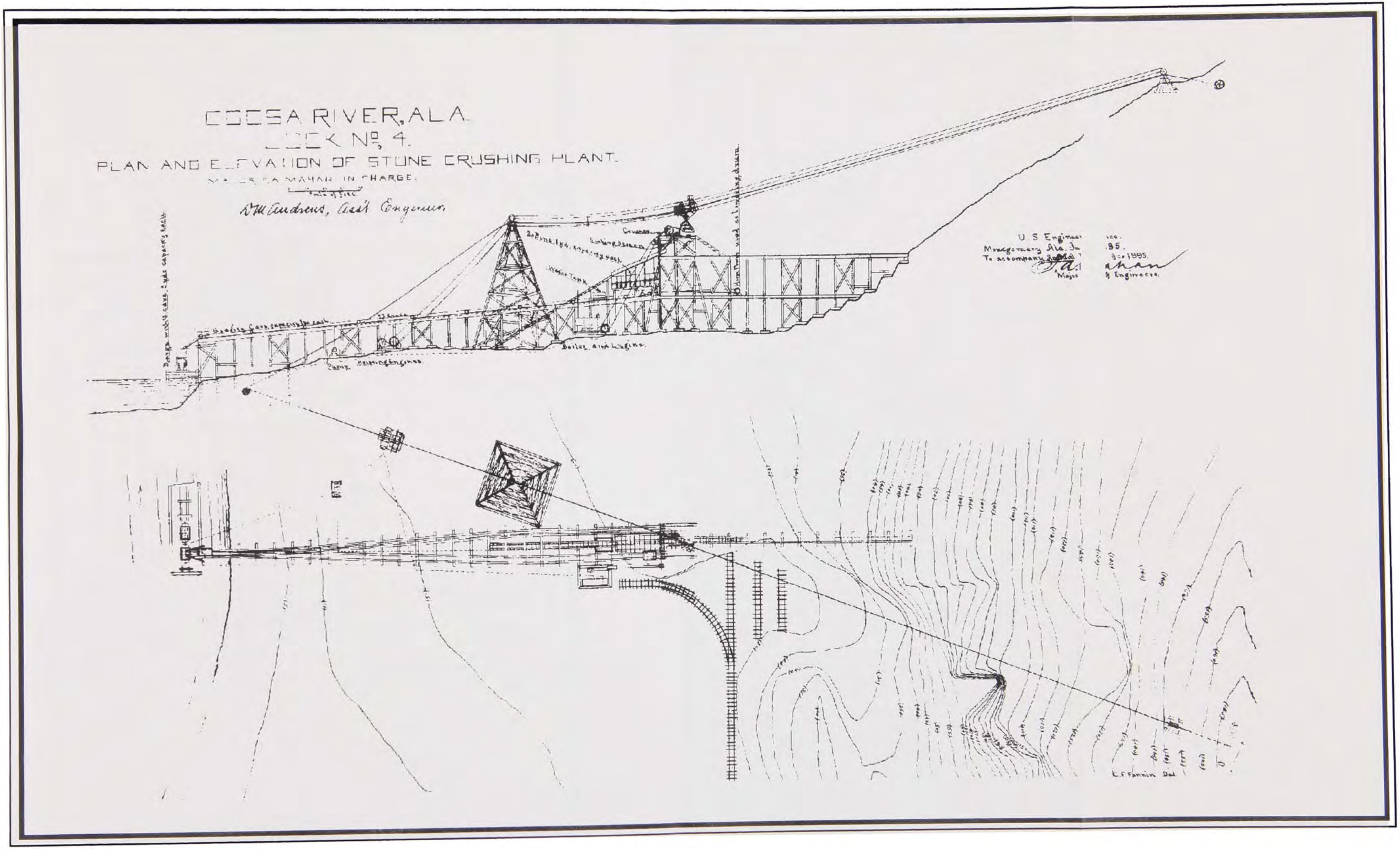
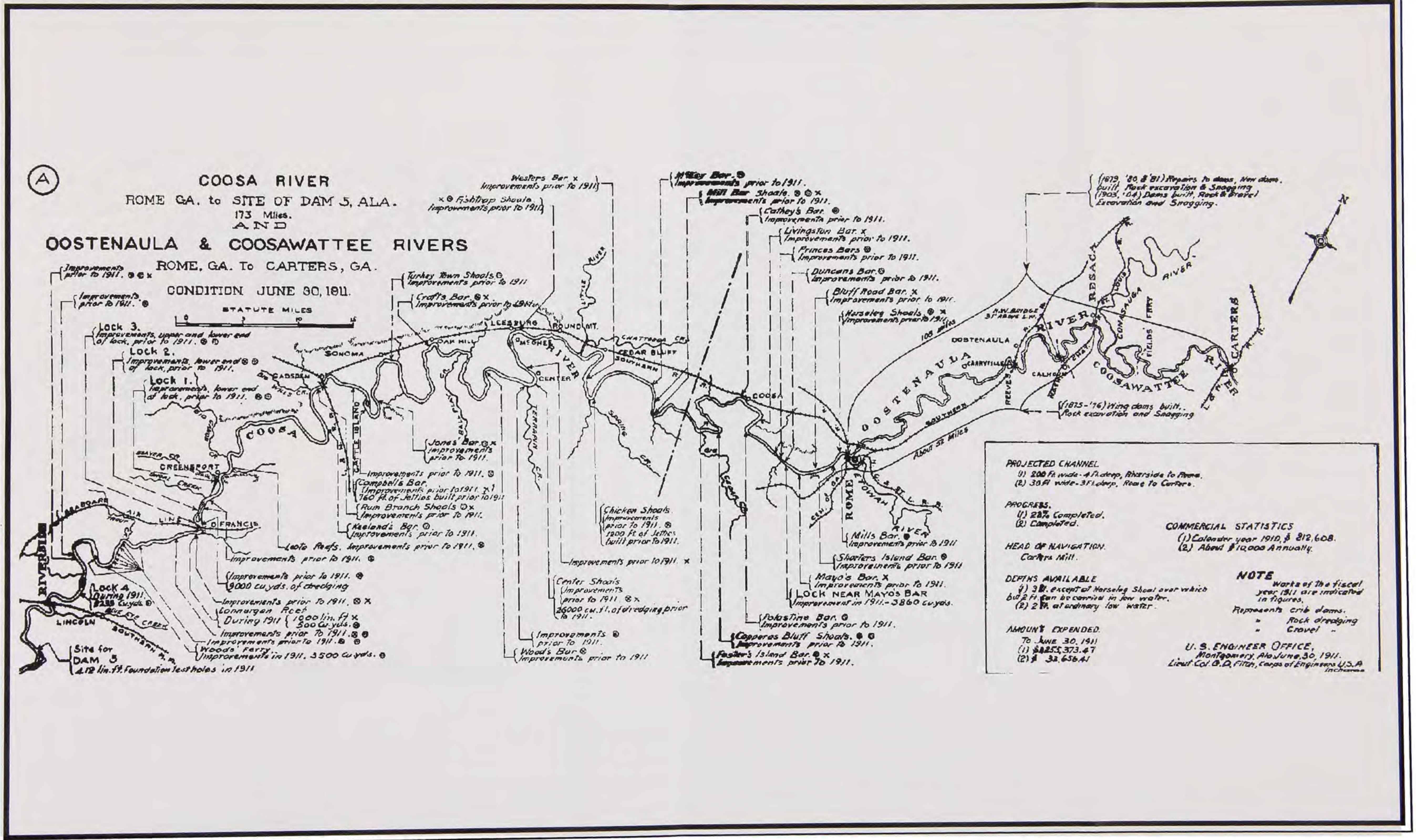
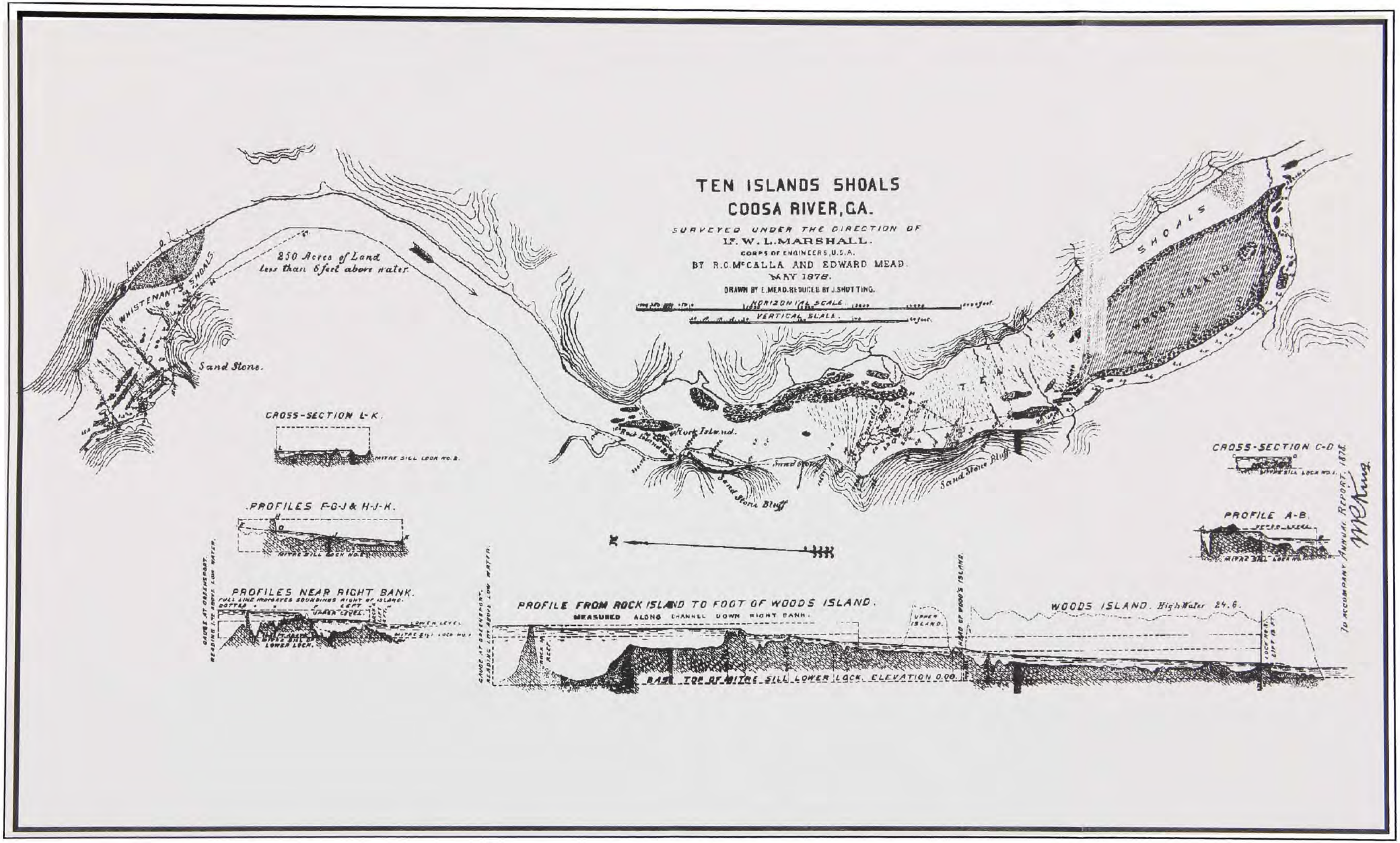


Figure 6-1. Plan and elevation for a stone crushing plant, Lock No. 4, Coosa River, Alabama 1895 (*ARCE*).



Map 6-2. A map showing the condition of the Coosa River, 1911 (*ARCE*). The map shows the sites of the four completed locks and the dam constructed at Lock No. 5 (never completed).



Map 6-3. Map of the Ten Islands Shoals, Coosa River, Alabama, 1878 (*ARCE*). This was the site chosen for the first locks constructed on the Coosa River.

and the survey was conducted by Assistant Engineer Charles Firth. The survey commenced in May 1889 at Lock No. 4, 3.5 miles above the Georgia Pacific Railway crossing, and was completed in November at Wetumpka.[21] The survey focused once again on navigation improvements that would link Wetumpka, in the lower part of the basin, with the improvements already completed on the upper Coosa. The only improvement possible within the 116.5-mile segment surveyed was slackwater navigation.[22] This survey recommended 27 locks, with a combined lift of 300 feet, placed at average intervals of 4.3 miles. The locks, No. 5 through No. 31 would begin in the upper Coosa basin and end at Wetumpka. Lock dimensions were increased again from 210 feet by 40 feet to 322 feet by 52 feet to accommodate larger boats. The new dimensions would give an inside length of 280 feet. Also, channel width was increased to 100 feet and a depth to 4 feet to accommodate the larger boats. The improvements would cost in excess of $6 million.[23]

Work began in 1891 and 1892 on selecting the site for Lock No. 31 and in surveying for the exact sites for Locks No. 29 and 30. Construction commenced on Lock No. 31 in September 1891, but it was never completed. In 1903, Congress authorized funds to survey the Coosa once more to determine the advisability of completing authorized or projected improvements. The survey was completed in 1904 and recommended against improvements beyond completion of Lock and Dam No. 4 and a dam without a lock at site No. 5. Minor surveys made in 1909 and 1910 contained similar recommendations.

An important and extensive survey was conducted in the basin in 1913 to determine if storage reservoirs on the Etowah, Coosa, Tallapoosa, and Alabama Rivers could be used to provide power. The survey also examined cost to determine which party or parties should fund improvements: the Federal government, state and local governments, or both in association with private industry. The last major survey was authorized in 1915 and completed in 1920. For nearly a decade prior to 1920, the District Engineer's position was that the cost of improvements significantly outweighed benefits. The pattern of negative assessments led the Board of Engineers in 1920 to recommend no more than low-cost routine maintenance of completed improvements.

Despite the expectations of local and state officials and Army Engineers that the navigation improvements on the Coosa River would spur prosperity along the river, the population increase and commercial activity failed to materialize. For nearly 100 years improvement of the Coosa had been an abiding interest of the state and of the Army Engineers. By the early twentieth century, however, further development of the river was considered to be without benefit and all work was discontinued. Aspirations for the economic prosperity of eastern Alabama died with the cancellation of Corps activity on the watercourse.

The Coosa and Tennessee River Canal

Early attempts to persuade Congress to fund the connection of the Tennessee and Coosa rivers failed. In 1872, a final attempt was made to convince the government of the utility of such a connection. Congress authorized a survey to determine feasibility and cost. The survey report proposed that a canal linking the two rivers should begin near Guntersville, Alabama, on the Tennessee River. Through a series of canals and reservoirs, and even a tunnel, boats could ascend the divide between the Tennessee and Coosa Rivers and then descend into the Coosa basin.[24] The formation of the Coosa River Improvement Council, an organization composed of prominent citizens of the Coosa Valley, and intense lobbying by the Alabama legislature could not influence Congress to appropriate the $9.3 million necessary to fund the project. The hope for a Tennessee Coosa connection faded.

The Apalachicola-Chattahoochee-Flint River Basin

The Apalachicola-Chattahoochee-Flint (ACF) drainage basin consists of several large rivers and their tributaries that lie partly in eastern Alabama but largely in western Georgia. The Chattahoochee River, the major river in the system, rises in the northern part of Georgia and flows southward toward the Gulf of Mexico. Its mouth is at the junction of the Flint River in the southwest corner of Georgia, where the Apalachicola is formed by the confluence of the Flint and Chattahoochee Rivers. The head of navigation is Columbus, Georgia, some 233 miles above the mouth of the Chattahoochee and 360 miles above the mouth of the Apalachicola River.[25]

Interest in improving this system, particularly the Chattahoochee River, was related to capitalizing on the commercial development of Columbus. The city was a center for trade and manufacturing both prior to and after the Civil War and was important to the entire region extending south to the Gulf of Mexico. Commerce consisted of cotton, cotton seed, fertilizers, grain, naval stores, and general merchandise. Transportation and marketing of these products was intertwined with both the Flint and Apalachicola systems.[26]

Surveys of the Chattahoochee were authorized in 1871 and 1872. A project was approved in 1873 that would develop a channel 100 feet wide and 4 feet deep at low water. The improvement would include the use of jetties and wing dams to control the formation of sand and gravel bars, the removal of snags wherever necessary, and the blasting of rocks to widen and deepen shoals.[27]

C. F. Trill, a civil engineer hired to conduct the first survey, submitted a very positive report that was used in part to justify later improvements. Trill's report overstated the economic potential of the area, a practice that was common to reports from public and private agencies in the economic euphoria following the Civil War.[28] Trill made a detailed assessment of the agricultural productivity of the ACF system and speculated on its growth. He accurately described the area's weak transportation infrastructure relative to that of the North, and the railroads' monopoly on freight movement.[29] Trill saw an obvious solution in the development of the region's natural routes: its extensive river systems.

Trill felt that Apalachicola, not Savannah, was the natural outlet for the commerce of southwestern Georgia, western Florida, and southeastern Alabama. He also reported on the economic development of the major population centers along the various watercourses. While Columbus was dominant, Eufaula was considered a thriving economic center as well and worthy of advantages offered by navigation improvement. Fort Gaines, Georgia, also was mentioned. Bainbridge, Georgia, on the Flint, was considered the most important cotton center outside of Columbus. At the time, cotton was shipped from Bainbridge to Savannah.[30] Apalachicola was the major seaport for the ACF. Although the port handled most of the cotton trade for all of the inland watershed, the new economic focus was on timber. The volume of timber available, the port's strategic location on the Gulf of Mexico, and the fact that several major rail lines converged there supported the assumption that it was the logical site for the focus of economic activity in the river basin.[31]

Improvements to the ACF system typified Corps operations throughout the Mobile and Montgomery Districts. In support of national goals, the Engineers' intent was to enhance commercial opportunities by improving navigation. The numerous streams flowing through thickly vegetated areas were characterized by loosely compacted soils infused with sand and gravel, and contained much debris. Winter freshets deposited tons of tree limbs, trunks, and stumps in addition to sand, silt, and gravel from bank caving or reworking of the stream bed. Thick, almost jungle like, tree growth in the subtropical environment of the Gulf required constant trimming of limbs to reduce the hazard to steamboats.

The ACF system was plagued by thousands of snags lodged in its channels. A tendency for large and numerous landslides increased the amount of sand and silt that could form new bars or add to existing ones. Much of each annual appropriation was spent restoring the previous year's work, and the District Engineers recognized early in the development stage that any navigation improvements would be temporary.[32] Modest appropriations were made almost every other year from 1880 through 1904, and yearly thereafter. Between 1880 and 1912 nearly $1 million was allotted for the Chattahoochee River alone.[33] Figures on operations on the Chattahoochee for the following years illustrates typical operations for all rivers in the ACF system:

- 1884-1885: 1,100 snags, logs, and trees
  3 wrecked vessels; and
  3,764 cubic yards of rock removed
- 1886-1887: 1,733 logs and trees removed and
  3,007 cubic yards of marl excavated
- 1897-1898: 2,000 obstacles
  25 cubic yards of rock, and
  3,000 cubic yards of gravel removed[34]

Each year during this period more than 1,000 snags and more than 3,000 cubic yards of excavated material were removed. The removal of rock, gravel, snags, and other obstacles as in addition to the construction of brush-bank protection, the construction and repair of dams, the trimming of overhanging trees, and the maintenance of snag boats and other equipment.[35]

Navigation on the Chattahoochee River had always been difficult and was considered dangerous. Steamboats could travel only during daylight and were often detained for days by a single obstruction. Many boats were lost after hitting snags and sunken logs. By 1888, a fairly adequate, all-season, navigable channel was open from Chattahoochee, Florida to Eufaula, Alabama. A similar prospect existed from Eufaula to Columbus, except during extremely low water. Improvements in the channel enhanced navigation to the point that few accidents were reported by 1889 and steamboats could navigate at all hours. Appropriations were, however, consistently too low to complete all existing projects successfully.

By 1896, $273,000 had been spent on improvements to the Chattahoochee River.[36] Operations between 1888 and 1895 routinely consisted of removing extensive snags and obstructions, felling and trimming overhanging trees, and dredging sandbars. By the end of the fiscal year in June 1895, the low water channel below Eufaula was cleared of obstructions and boats drawing 3.5 feet could navigate with relative ease. Between Eufaula and Columbus, however, numerous sandbars still caused delays; steamers often had to wait from 1 to 48 hours to get around an obstruction. In addition, the river was generally full of snags and logs as a result of winter freshets.[37]

Improved technology, plus years of experience in handling the Chattahoochee's obstructions, led Major Frederick A. Mahan, District Engineer, to seek a new approach to maintaining a navigation channel. Instead of building dams of pile and brush, a small dredging machine would be used continuously to supplement the scouring action of the river's current.[38] Later equipment included a dipper dredge, considered by the Engineers as the only feasible means of keeping pace with debris disposal necessitated by rock blasting during navigation improvements.[39]

Complementary improvements were necessary on the Flint and Apalachicola Rivers to maximize those completed on the Chattahoochee. The Flint River also was obstructed by snags and by overhanging trees. Annual appropriations between 1874 and 1912 were used to remove thousands of snags and logs, and to break up rafts that jammed the channel.[40] By 1888, a high-water channel from the mouth of the river to Albany, Georgia, had been achieved, as well as a portion of a high water channel between Albany and Montezuma, Georgia.

The Apalachicola River is formed by the juncture of the Chattahoochee and Flint Rivers and it flows into St. George's Sound, a shallow expanse of water separated from the Gulf of Mexico by several barrier islands.[41] The river was improved by removing snags and overhanging trees to complete a channel 100 feet wide and 6 feet deep at low water. Annual removal of snags and overhanging trees was considered essential. Modest funds were expended during the early frontier period, but no major operations were conducted on the Apalachicola between 1831 and 1874.[42] Operations after 1874 were mainly to remove snags and logs. Work was done as well to widen and straighten the river's channel through the Styx River and Moccasin Slough, which bypassed some six miles of the main river channel that was beyond improvement. The hydraulics on this stretch of the ACF meant improvements could be only temporary; an annual appropriation would be necessary to maintain any progress made in the previous work season.[43]

The justification for the river basin's development, of course, was the need to transport the various products originating in the interior to the Gulf of Mexico. Therefore, the success of much of the interior trade would depend upon navigation improvement in Apalachicola Bay. The development of this area began in the early 1870s as well.

To supplement insufficient commercial statistics generated just prior to the Civil War, and based on the projected development of a timber industry (the ACF drainage basin held extensive stands of yellow pine), Damrell was instructed in 1871 to make a survey of the mouth of the Apalachicola River and recommend improvements. Commerce for the city of Apalachicola was handled through two access routes into St. George's Sound: East Pass, a narrow outlet between St. George's and Dog Islands; and West Pass, the principal outlet, located between two of the barrier islands to the western side of St. George's Sound. Both of the passes allowed vessels of 11-foot draft to cross at low water. The problem was that ships using West Pass could not reach the wharves at Apalachicola. About a mile below the city the channel shoaled to a depth of 4 feet; elsewhere it had a depth of over 20 feet at the city itself. Removal of the bar at the mouth of the river was the obvious solution to opening up the city to commercial expansion.[44] The bay was reexamined in 1878 and a new project was authorized, calling for a channel to be dredged through the bar at the mouth of the Apalachicola River. It would be 100 feet wide and 11 feet deep at mean low water.[45]

The channel improvement was intended to accelerate Apalachicola's commercial development. Railroad competition and severe silting of the bar at the mouth of the river had ruined the city's economy. However, the anticipated revitalization reported by Damrell in 1871 failed to materialize. Estimates a decade later were less than enthusiastic.[46] Continued improvement through dredging and channel expansion did have some positive impact on development of the area's commerce from 1880 to 1912, by which time over $400,000 had been invested in improvements.[47]

Results, however, were never totally satisfactory as appropriations were insufficient and too irregular to complete the improvement in any one season, and silting occurred more rapidly than anticipated. Price, Montgomery District Engineer, felt that no channel would ever be totally satisfactory, but that if the 11-foot deep and 100-foot wide channel could be dredged at one time there might be less silting. The project was periodically delayed in hopes of additional funding, but by March 1889 the depth of the channel had silted to 4 feet and commercial use of the port was seriously hampered. The Alabama Dredging and Jetty Company of Mobile contracted to dredge a channel 8 feet deep and 100 feet wide over the bar. Similar operations were carried out intermittently for years.

Additional River Operations

Other minor rivers in the Coosa and ACF basins also were improved to accommodate local usage. The eastern river basins in the Montgomery District contained nearly 60 different river, creek, harbor, and bay projects that the Corps was responsible for surveying, improving, and maintaining.[48]

The removal of logs, snags, and other debris obstructing the navigation channels was a yearly necessity, as testified to in the *Annual Reports* of the Chief of Engineers.

The Choctawhatchee River in Alabama and Florida is one of the smaller rivers flowing into the Gulf. Improvement of this channel was authorized as early as 1872. The intent was to create a low water navigable channel from its mouth to Geneva, Alabama, and a high water channel from Geneva to Newton, Alabama. By 1888 low water navigation was possible from the mouth to Geneva, although little progress had been made above that point. By the turn of the century, both Geneva and Newton were anticipating rail connection with other towns and enthusiasm waned for further river improvements. Minimal efforts kept the channel below Geneva marginally navigable, primarily to allow timber rafts to move downstream.[49]

Improvement of the Escambia and Conecuh Rivers in Florida and Alabama called for removing snags, sunken logs, and other obstructions from the channel; closing cutoffs; and cutting through rock shoals from the mouth of the river in Pensacola Bay to Indian Creek, an estimated 273 miles. The objective was to facilitate the downstream shipment of lumber and to provide steamboat navigation upstream. The chief commercial value was the movement of timber to the port of Pensacola, reportedly supplying that city with 60 percent of its export lumber and timber trade.[50] By 1889, the lower 118 miles of channel were cleared. In addition, work was completed on opening the shoal at the mouth of the river, a constant problem due to silting. By 1901, the navigation project was accomplished and only routine maintenance was envisioned.

River basins assigned to particular Districts have remained largely fixed since formal organization in 1888 except for occasional changes. Both the Oconee and Ocmulgee Rivers in eastern Georgia, now part of the Savannah District, were reported (only in 1888) as part of the Montgomery District. Improvements to the Oconee and Ocmulgee Rivers (removal of snags, sunken logs, and overhanging trees) mirrored others in the region. The Ocmulgee also was beset by sand and gravel bars and rock reefs. Although the removal of many of these obstructions aided navigation, the improvements could not be maintained. A new snag boat was built by Messrs. M. A. Sweeney and Brothers of Jeffersonville, Indiana, to facilitate improvements on both rivers.[51]

Important surveys and improvements also were made to the Etowah River and to the smaller Oostenaula and Conesauga Rivers in northern Georgia, headwater tributaries of the Coosa. One early survey was associated with a feasibility study for the Georgia Canal. The canal was divided into river sections, the Little River, Chattahoochee, Yellow River, and

Ocmulgee, that would connect Macon and Rome, Georgia, and cover a total of 211 miles. Such a canal would connect the Atlantic coast via the Ocmulgee River with the Gulf of Mexico via the Coosa. Cost of construction was estimated to exceed $20.5 million.[52] Other surveys were conducted on portions of the Etowah River but no navigation improvements were funded because of the negligible commerce on the river. Modest funds were appropriated during the late nineteenth century to effect minor improvements to the Oostenaula and Coosawattee Rivers. Removal of snags and debris, and construction of small riprap dams made up the bulk of the work. Both streams were navigable for shallow-draft vessels used for local trade.[53]

The Tallapoosa River, the major tributary combining with the Coosa to form the Alabama River, was particularly dangerous to navigation because of the great accumulation of sunken logs, snags, overhanging trees, sand and gravel bars, and rock reefs. Improvements authorized in 1880 were intended to open a channel 60 feet wide and 3 feet deep at low water from the mouth of the river to the foot of the Tallassee Reefs, two miles below the town of Tallassee, Alabama. Appropriations were sporadic and only minor improvements were accomplished by 1889. All logs and snags were cleared from the river channel's junction with the Coosa upstream to the Tallassee Reefs, a distance of 48 miles, making the river navigable year-round for boats of 20 inch draft.

Another river receiving periodic attention was the Cahaba, a major tributary to the Alabama. Its improvement was intended to open navigation from the mouth of the river to Centreville, Alabama, 88 miles upstream. Although some improvements were accomplished by 1886, maintenance was delayed by a proviso in the Rivers and Harbors Act of 1886 that disallowed further improvements until the railroad and other bridges across the Tallapoosa were provided with sufficient draw openings. As of 1889, these openings had not been provided, and the funds appropriated for the Cahaba had been transferred for use on the Escambia and Conecuh Rivers.[54]

The other significant river basin in the Montgomery District is the Alabama. The Alabama River is formed by the junction of the Coosa and Tallapoosa Rivers near Wetumpka and flows in a southwesterly direction from east-central Alabama to the upper reaches of Mobile Bay. The improvements accomplished on this river since the initial survey of 1875 consisted of removing snags, overhanging trees, and various obstructions from the riverbed to produce a channel 200 feet wide and 4 feet deep at low water from the mouth of the river, 50 miles above Mobile, to Wetumpka, more than 380 miles up the river. By 1888, the proposed improvements to the channel were completed, but insufficient funding was making it nearly impossible to maintain them. Starting in 1878, more than 10,600 snags had been removed from the channel. However, new ones resulted from caving river banks and each winter's rains carried new debris down from adjoining tributaries.[55] Operations through the early decades of the 1900s continued to focus on the removal of snags and on dredging sandbars as needed to maintain a proposed low-water channel 200 feet wide and 4 feet deep.

Bay and Harbor Projects

In addition to the various surveys and operations carried out in river basins, significant efforts were expended to improve navigation in the bays and harbors of the Florida panhandle, and to facilitate commerce between these bays and New Orleans. Pensacola Bay and Harbor was a principal project authorized for improvement. Additional coastal projects included Apalachicola Bay, St. Josephs Bay, St. Andrews Bay, and Carrabelle Harbor. For a brief time, Tampa Bay surveys were handled out of Mobile or Montgomery but no major projects were initiated there.

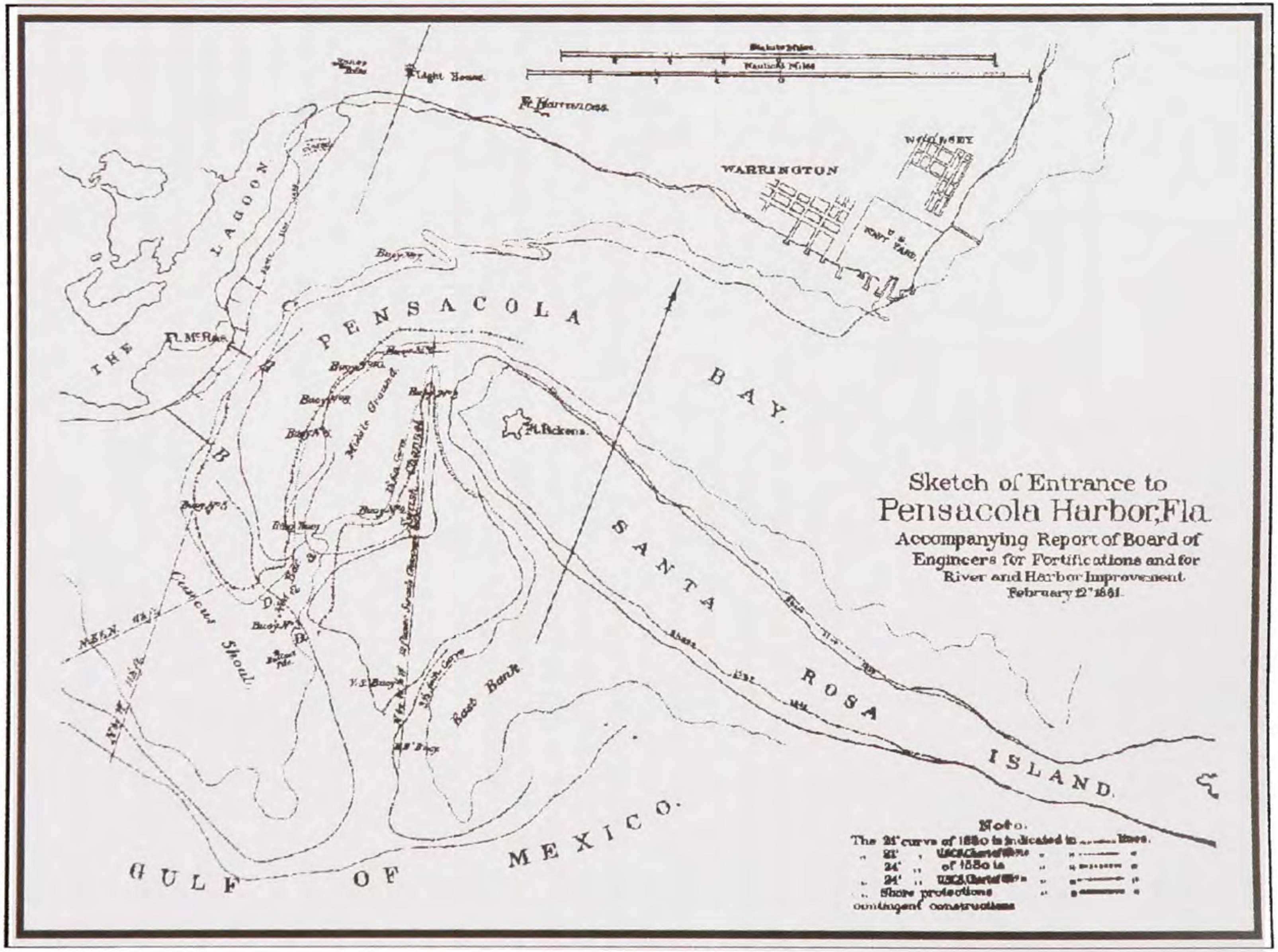
Pensacola Bay's strategic importance for control of the West Indies trade and for military defense of the Gulf of Mexico dates from the Spanish colonial period. The United States also recognized the strategic value of Pensacola's harbor by selecting it to be the naval depot for the Gulf frontier. The high expectations for commercial development, however, never developed to the extent anticipated.

Appropriations were made for improvement of the harbor in 1878, including a survey and an estimate for removing wrecks.[56] Work on removing four wrecks commenced in the fall of 1878 and was completed in December 1879. A survey also was made at the mouth of the bay to determine the extent and cause of the severe shoaling in the main ship channel. (Vessels sometimes had to wait days or even weeks for a sufficiently navigable depth over the bar to either enter or exit from the harbor). Authorization and funding for the improvement of the harbor followed in 1881. The main objectives of the project included construction of a jetty in front of Fort McRee and dredging of a channel through the inner bar to achieve a 24-foot depth and 300-foot width (provided funds were available after reaching the desired depth). Any excess funds would be used to protect the shore against possible scour as a result of jetty construction.[57] Trade would, of course, be facilitated but the improvement would enhance access to the navy yard as well.

The channel into Pensacola Bay had long been the site of problems. As early as 1855, the washing of the western shore was severe enough to expose the foundation of the *pan coupe* at Fort McRee. The Middle Ground Shoal, located in the channel between Santa Rosa Island and Fort McRee, had migrated and connected with the east end of the Caucus Shoal (Map 6-4), reducing the channel's depth. A series of short jetties constructed along the western shore between 1855 and 1860 had only limited success in restoring the beach there. The jetties were not anchored to the bottom of the bay, they had since disappeared. As a result, the western shore had been receding as far as Fort McRee, and caused nearly all of the masonry to fall as a result of undermining.[58] The Board of Engineers wanted the western shore stabilized because Fort McRee was still a potential battery site. The western shore was partially stabilized by 1888, but the anticipated natural scouring of the channel did not materialize. Dredging of the channel was only partially successful because shoaling, particularly by expansion of the Middle Ground Shoal, continued to occur. Over $200,000 was spent without measurable improvement to navigation, causing corresponding delays in development of the port's trade potential.

At the time, Congress did not consider Pensacola Harbor worthy of permanent improvement; the limited funds expended to date had failed to halt shoaling and the jetties built to protect the western shore were deteriorating.[59] A small appropriation in 1889 was used exclusively for shore protection. A major storm had all but destroyed the jetty system built at the Fort McRee site and work was concentrated on replacing the former jetties, which were composed of brush and stone.[60]

The construction of the new jetty system at Pensacola represented a new technique in harbor protection and typified the rapidly evolving engineering technology during America's rise as an industrial power. The original jetties were built of close pilings filled with alternate layers of stone and brush; side slopes were of the same construction. The new jetties (Figure 6-2) were constructed over the remains of the old system by covering them with a coping and using side slopes of heavy stone and concrete blocks. The work was completed in 1890 and used 2,681 tons of granite, with the larger stones weighing 1 to 4 tons. Three sizes of concrete blocks were used: 3 by 3 by 5, 3 by 3 by 10, and 4 by 4 by 6 feet weighing, respectively, approximately 3, 6, and 6.75 tons.[61] In all, 402 cubic yards of blocks



Map 6-4. Sketch of the entrance to Pensacola Harbor, 1881 *(ARCE)*.

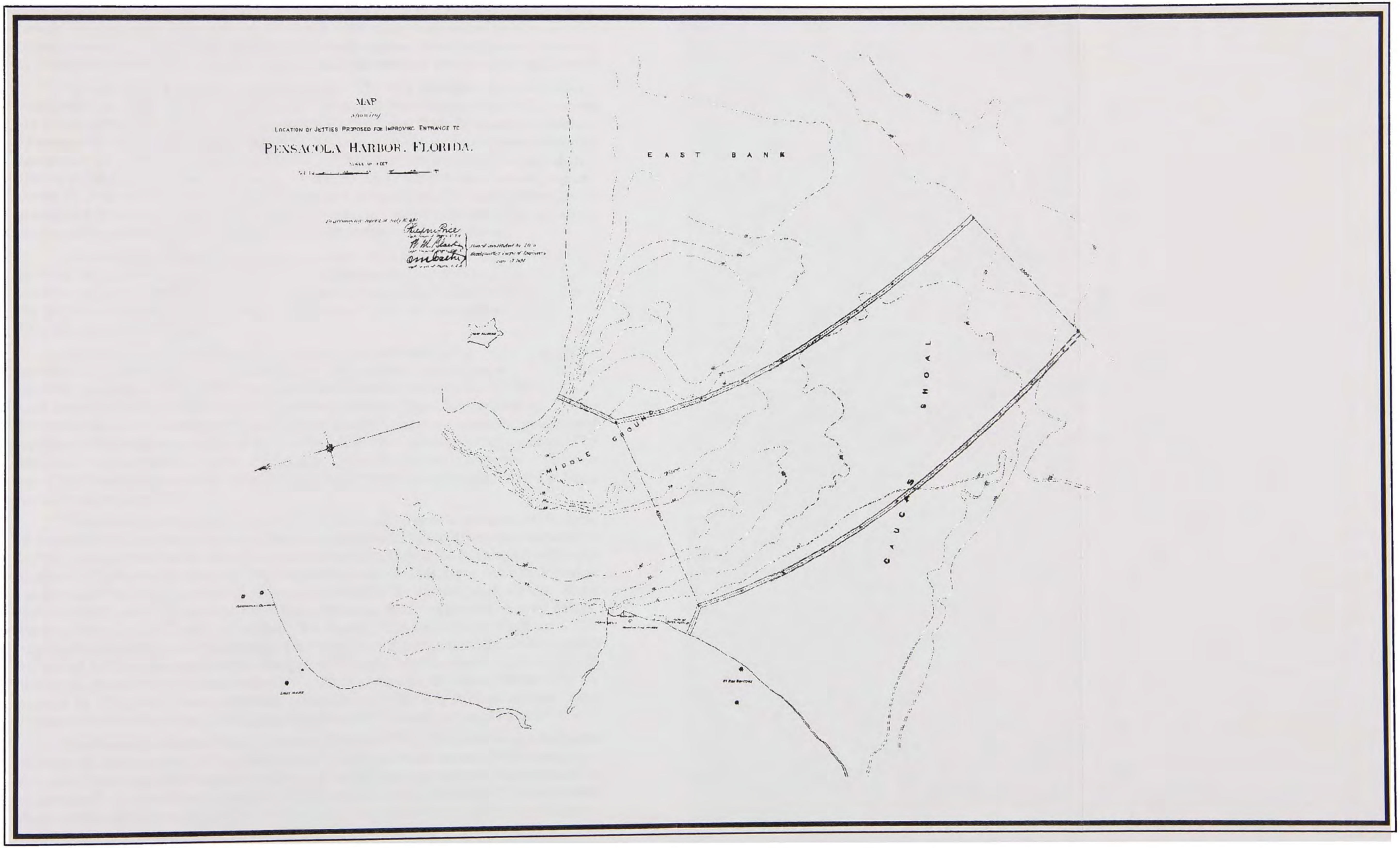


Figure 6-2. Pensacola Harbor, proposed jetties, 1890 (National Archives).

were used. After the foundations were raised to mean low water, an additional 12 feet of concrete was placed as a cap. The jetty was anchored securely to the shore by extending the construction 39 feet inland. The result proved entirely satisfactory after the new jetties held against several unusually severe storms without any settlement or damage to the structures.[62]

Channel dredging continued sporadically. The U.S. dredging steamer *Gedney*, belonging to New York Harbor, was loaned to Pensacola and dredging began 1 November 1895. Dredging presented problems for the District Engineer from the outset, as it had for Rittenhouse Moore. The original dredge to be used was lost in transit from Mobile to Pensacola. Its replacement was so poorly built it had to be hauled off for repairs shortly after work began. Delays recorded between 7 and 30 June 1893 indicate the slow progress: almost 95 hours of pumping time were recorded as contrasted with 249 hours of time lost in turning and dumping or due to repairs and other causes.[63] Subsequent dredging operations under contract to Rittenhouse Moore continued favorably for years afterward.

Assigning the Engineer at Pensacola a plant for continuous dredging would have meant a 50 percent savings annually over contracted dredging. However, funds for construction of a government plant for the bay were not approved. As late as 1902, Pensacola still had to borrow dredges from other Districts; the *Comstock* was borrowed in that year from the Galveston District.[64]

That same year, the Montgomery District's plea for a sea-going dredge was finally approved when $150,000 was appropriated for its purchase. Authorization to expand the harbor by dredging a channel 30 feet deep and 500 feet wide from the Gulf of Mexico to the dock line at the east end of Pensacola must have influenced the congressional decision to appropriate funds for the dredge. Contracted costs for dredging were exceeding government estimates and Corps ownership of a dredge was believed to be a way to reduce costs. The new dredge was delivered to Pensacola 5 August 1905. The boat had just begun work when one of her firemen came down with yellow fever and the ship had to be quarantined at Santa Rosa Island for a month.[65]

For almost another decade, the main operations at Pensacola consisted of dredging on the outer and inner bars to improve the channel authorized by the Rivers and Harbors Act of 1902. As usual, the major obstacle to progress was insufficient funds. Despite the District Engineers' efforts to apply funds wisely, work completed one season was often destroyed or compromised by shoaling before funds became available for another work season. Some years no funds were appropriated for existing projects. Bad weather also caused delays. Work on the outer bars frequently exposed the floating plant and crew to rough seas. The magnitude of the Pensacola Harbor project, with work in progress around the clock, resulted in the need for frequent repairs to the dredge. While some routine repairs could be done in Pensacola, others had to be undertaken at the Mobile drydock facilities. Sometimes, for example in 1912, the *Caucus* was taken completely off the job at Pensacola and used elsewhere (in this case to begin dredging operations in St. Andrews Bay, Florida).[66]

The Pensacola channel finally was completed in 1914. The result was a navigable waterway 30 feet deep and 500 feet wide from the Gulf to the city docks. While commerce was aided, there was little tangible evidence of either direct or indirect improvement to freight rates.[67] Despite the expense and difficulty in completing the harbor's improvement, freight rates remained on par with those of Mobile. The improvement of Pensacola Harbor proved stable; only routine maintenance was required for a number of years after the channel was completed. By 1918 over $2 million had been expended on the improvements to Pensacola's harbor and bay.[68]

As improvements at Pensacola neared completion, the Montgomery District focused on other harbor projects. These were similar operations but on a much reduced scale. Renewed interest in an inland coastal waterway surfaced in 1916 with an examination and survey investigating the feasibility of connecting Pensacola and Mobile. The idea of connecting the two bays with a canal was first proposed in the 1830s.

Other improvement projects slated for the Montgomery District included the Florida harbors at Apalachicola Bay, St. Andrews Bay, Carrabelle, and St. Josephs Bay.[69] Apalachicola Bay was the most significant improvement, St. Andrews Bay and Carrabelle Bar and Harbor were relatively equal in terms of funds expended, and St. Josephs Bay was considered the least pressing need.

Apalachicola Bay

Apalachicola Bay represents an intermediate harborage between Pensacola and Tampa Bay. The river and bay served as the commercial outlet for trade (primarily in cotton, timber, and naval stores) in the Chattahoochee and Flint drainage areas. The Apalachicola system was recognized early in the Gulf frontier's history as an important navigation artery into the interior of eastern Alabama and western Georgia. Nevertheless, few improvements were accomplished before the Civil War. Pressures to fortify the larger harbors resulted in most funds being encumbered for defense-related projects.

The first major examination of Apalachicola Bay was conducted in 1871 and a reexamination was made in 1878. The resulting recommendation called for dredging a channel 100 feet wide and 11 feet deep across the bar at the mouth of the Apalachicola River. The project was authorized by Congress in 1880 and bids were opened in the fall of that year. An additional $10,000 was appropriated in 1881 (no work had commenced), providing $20,000 toward the estimated $100,000 needed to complete the project.[70] At the time, dredging was not considered to be a permanent solution to the shoaling problem at the river's mouth. The project was still underfunded and incomplete in 1888. Progress, however, was made and a channel 3,635 feet long, 60 feet wide, and 9 feet deep was opened.

The District Engineer, Captain R. L. Hoxie, lamented the fact that shoaling continued to offset progress and prevented the channel from being opened in its entirety. Shoaling continued to plague Engineers from 1865 to 1918. The Apalachicola Bay improvement problems were described in the 1889 *Annual Report*.[71] Deposits brought down by the river and current action in the bay had caused the channel to shoal to a depth of four feet. Because the previous year's funds had been insufficient, the decision was made to delay the project pending acquisition of sufficient funds to complete it entirely. However, the shoaling became so severe that bids were let to alleviate the problem. It was anticipated that a channel 8 feet deep and 100 feet wide could be attained with the $20,000 on hand.[72] The channel improvement was carried out by the Alabama Dredging and Jetty Company of Mobile (Figure 6-3).

By June 1896, over $180,000 had been spent in a futile attempt to improve navigation in Apalachicola Bay. The piecemeal approach to project improvements resulted in continual reworking of the previous year's efforts. In 1896, District Engineer Mahan cited previous experience in stating that 50,000 to 60,000 cubic yards of material would have to be removed annually just to contain the shoaling. The permanent improvements resulting from completion of the project at one time could not be estimated. However, the belief was that the increased commerce of Apalachicola demanded a deeper and wider channel and that an 11-foot-deep by 200-foot-wide channel might offset the effects of shoaling.[73]

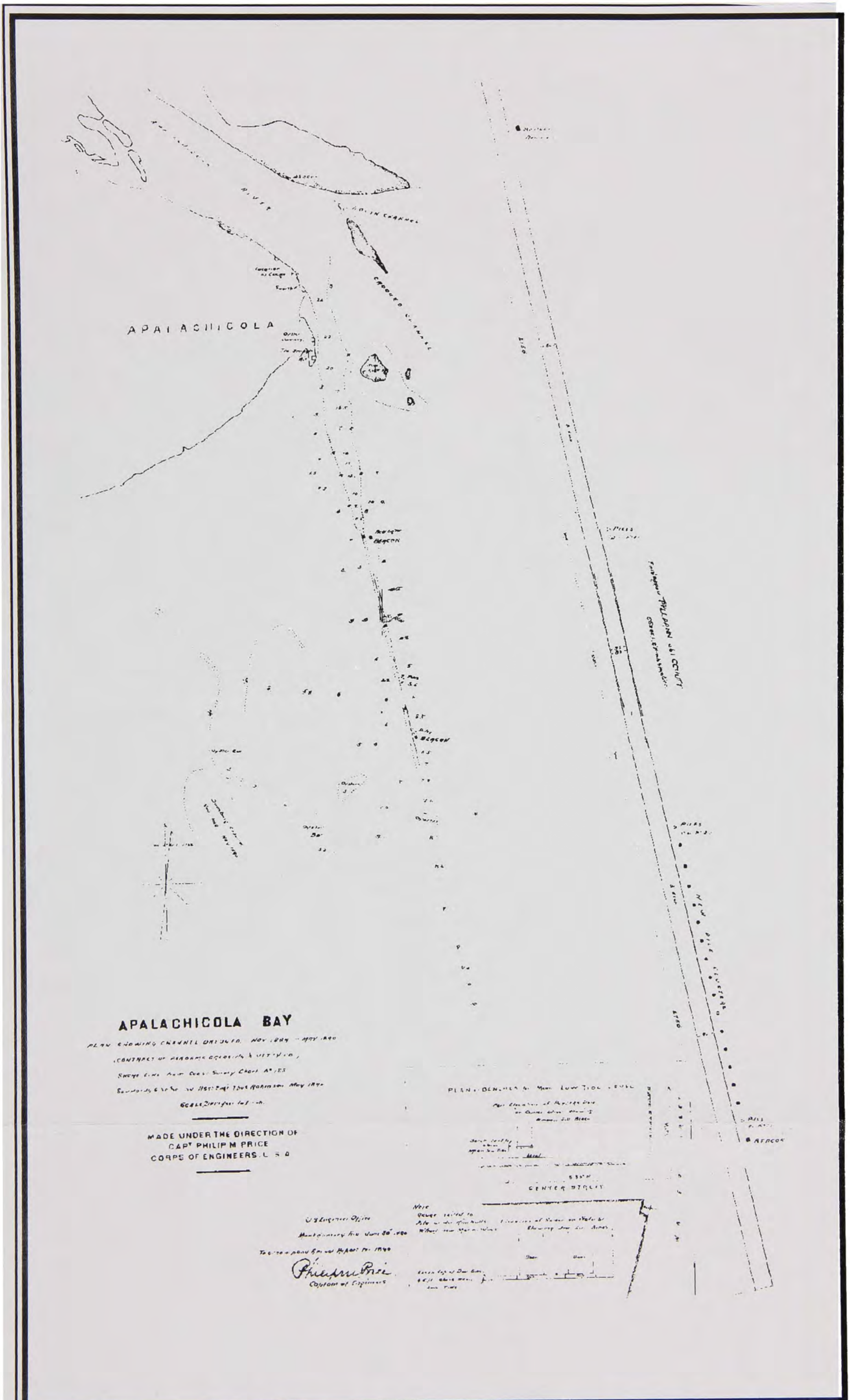
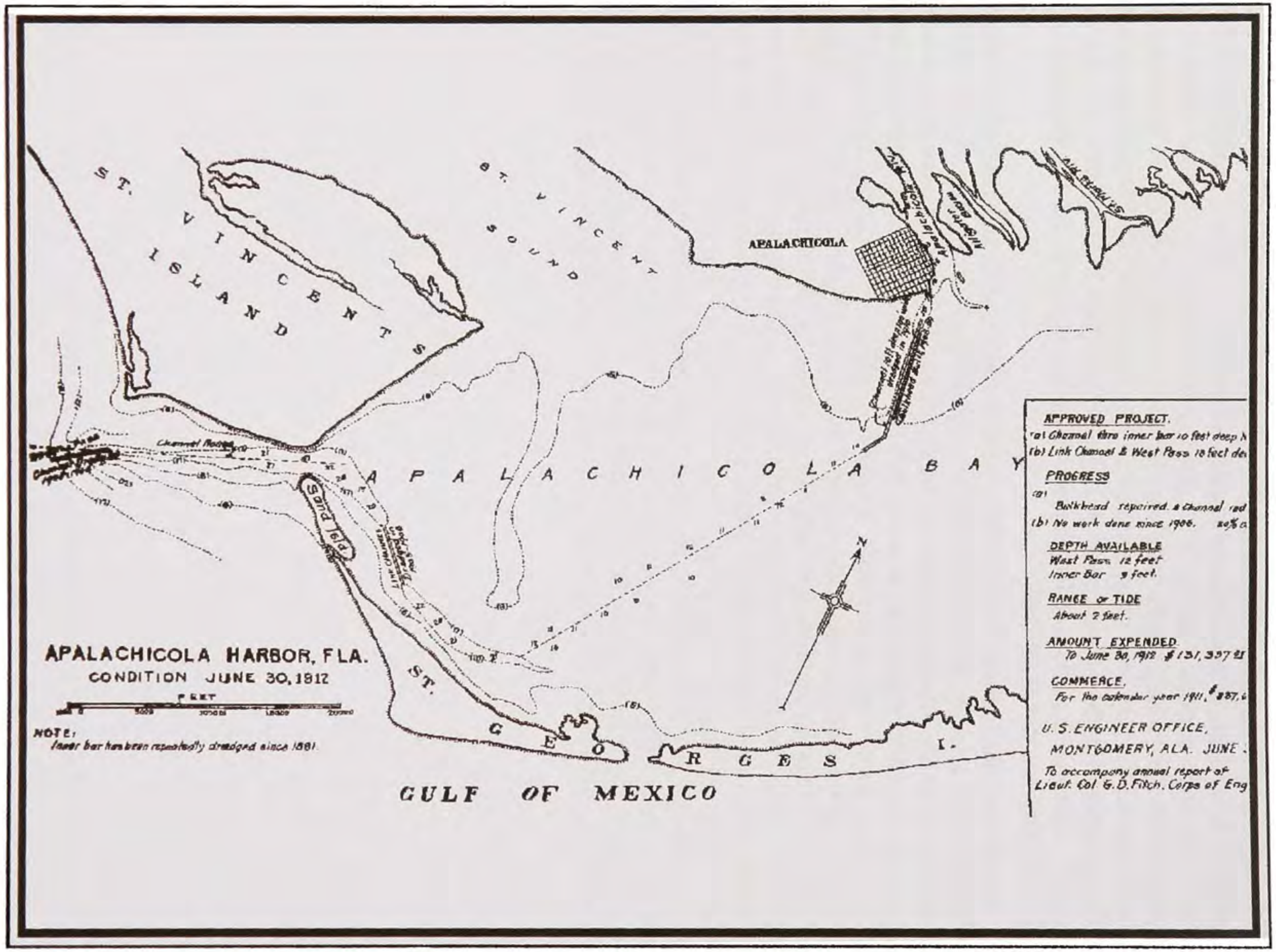


Figure 6-3. Apalachicola Bay showing the channel dredged by Alabama Dredging and Jetty Company 1890 (*ARCE*).

Dredging was an annual operation in the bay for more than a decade; minor improvements to navigation were accomplished in the process. As usual, insufficient funds meant irregular work seasons. As of 1912, much work remained to be done (Map 6-5). Engineers felt that Apalachicola deserved closer attention because of its unique geographical position. It was still the only deep-water port in the 380-mile stretch from Tampa to Pensacola, a situation unequaled on the Atlantic coast and possibly along the Gulf except in the Florida peninsula.[74] Despite the District Engineer's steadfast support, the improvement of Apalachicola Bay was never realized.

The Rivers and Harbors Act of 1909 expanded the scope of Engineer efforts along the Gulf coast with a survey to determine the site for an inland waterway from St. George Sound in Florida to the Mississippi River at New Orleans.[75] In order to determine where deep water development should take place to facilitate navigation on this proposed inland waterway, three ports were considered: Apalachicola, Port St. Joe, and Panama City. Apalachicola was rejected because of its uncontrollable silting. Port St. Joe was too exposed to the Gulf, and its marshy hinterland offered little potential for railroad development. Thus, Panama City was chosen by the Engineers for the deep water development.[76] Despite pleas for a deeper, permanent channel, commercial navigation of the Apalachicola River was limited to vessels drawing two to four feet of water. A channel 5 feet deep and 65 feet wide was considered adequate for navigation between Apalachicola and St. Andrew Bay; such a channel was completed by the Corps between 1911 and 1915. Further improvements to the channel were not made until shortly before World War II.[77] The connection of the various sounds and bays ultimately would result in the creation of the Gulf Intracoastal Waterway.



Map 6-5. Apalachicola Harbor, Florida, 30 June 1912 *(ARCE).*

1 U.S., Congress, House, *Index to the Reports of the Chief of Engineers, U. S. Army, Corps of Engineers, 1866 1912*, Vol. I Rivers and Harbors, H. Doc. 740, 63d Cong., 2d sess., 1915. Hereafter cited as *Index to Reports*, 1866 1912.

2 U.S., Congress, House, *Examination of Coosa River, Alabama*, H. Exec. Doc. 94, 51st Cong., 1st sess., 1890, p. 11. Hereafter cited as *Examination of the Coosa River, 1890*.

3 *American State Papers, Public Lands*, "Lands Granted to Alabama for the Improvement of the Navigation of Certain Rivers," Vol. 5, No. 642, p. 187ff. Hereafter cited as ASP-PL. ASP-PL, "Application of Alabama for a Further Grant of Land for Internal Improvements," Vol. 5, No. 734, p. 435ff.

4 William Elejius Martin, *Internal Improvements in Alabama*, (Baltimore: The Johns Hopkins Press, 1902), p. 50. The "three per cent fund" consisted of monies paid to the state by the treasurer of the United States from the sale of government lands within Alabama. Hereafter cited as Internal Improvements. See Thomas McAdory Owen, *History of Alabama and Dictionary of Alabama Biography*, Vol. II (Chicago, IL: S.J. Clarke Publishing Company, 1921), pp. 1342 43.

5 *Internal Improvements*, p. 41.

6 *ARCE, 1871*, p. 561.

7 Ibid., p. 563.

8 Ibid., pp. 563-564.

9 Ibid., p. 572.

10 *ARCE, 1872*, p. 502.

11 Ibid.

12 Ibid., p. 543.

13 *Examination of the Coosa River, 1890*, p. 12.

14 *ARCE, 1872*, p. 540.

15 *Examination of the Coosa River, 1890*, pp. 4-9, 17-18.

16 The lock and associated improvements, known as Mayo's Bar Lock and Dam, were later completed and are now owned by the city of Rome.

17 Ibid., p. 12.

18 Ibid. The new locks were "to be of masonry; the water side and miter sills to be laid in cement, and also the land side in the vicinity of the hollow quoins, for a distance back from the hollow quoins and along the face of the lock of 10 feet. The rest of the lock masonry to be of dry stone. The coping, hollow quoins, facing of the miter sills, and the side of the lock chamber from water surface of lower level at low water to the coping, to be of cut stone, the rest of rubble. The lock to be 210 feet between miter sills and 40 feet wide...."

19 U.S., Congress, Senate, *Examination and Survey of Coosa River*, S. Exec. Doc. 42, 46th Cong., 3d sess., 1880, p. 50.

20 *Examination of Coosa River, 1890*, p. 13.

21 Ibid., pp. 9-10

22 Donald Gregory Jeane, *Evaluation of Engineering Cultural Resources: Lock No. 3, Coosa River, Alabama* (Auburn, AL: Auburn University, For the U.S. Army, Corps of Engineers, Mobile District, 1981), pp. 31-33.

23 Ibid., p. 33.

24 U.S., Congress, House, *Coosa and Tennessee Rivers*, H. Exec. Doc. 243, 42d Cong., 2d sess., 1872, p. 2. The survey called for a canal to begin "at or near Guntersville on the Tennessee R., the canal would have to be carried up the valley, either of Short Creek or of Town Creek, until a convenient point could be reached for crossing into the valley of Will's Creek....In either case water supply would be deficient several months each year, but could be supplemented by reservoirs....A canal 70 feet in width at the surface and 5 feet deep with the waterway through the tunnel contracted to 46 feet with a channelway of 34 feet with locks of the same breadth. The estimated cost is $9,300,000."

25 *Index to Reports*, 1866-1912, p. 621.

26 Ibid., p. 620.

27 *ARCE, 1881*, pp. 1182-83.

28 Following Reconstruction, southern communities vigorously campaigned for regional investment. It was not uncommon to form associations to promote areas (similar perhaps to Chambers of Commerce today), and petitions and pamphlets touting a given area as the most suitable location for economic investment were common. These advertisements often were printed locally and usually exaggerated the social, economic, and health benefits to be derived. Newspapers sometimes carried advertisements as well.

29 *ARCE, 1872*, pp. 623-624.

30 Ibid., p. 626.

31 Ibid., pp. 626-627.

32 *ARCE, 1881*, p. 1184.

33 *Index to Reports, 1866-1912*, p. 620.

34 Ibid., pp. 620-621.

35 Ibid., p. 621.

36 *ARCE, 1896*, pp. 1356-57.

37 Ibid., p. 1361

38 Ibid., p. 1363.

39 *ARCE, 1901*, pp. 1259-63.

40 *Index to Reports, 1866-1912*, p. 622.

41 *ARCE, 1872*, p. 618.

42 *Index to Reports, 1866-1912*, p. 616.

43 *ARCE, 1881*, p. 1189.

44 *ARCE, 1872*, p. 618.

45 *ARCE, 1881*, p. 1190.

46 Ibid., p. 1189.

47 *Index to Reports, 1866-1912*, p. 614.

48 Ibid., p. 611.

49 *ARCE, 1901*, p. 1778.

50 Ibid., p. 1786.

51 *ARCE, 1888*, pp. 155-156.

52 *ARCE, 1872*, pp. 526-535.

53 *Index to Reports, 1866-1912*, p. 641.

54 *ARCE, 1889*, p. 183.

55 *ARCE, 1888*, pp. 1188-89.

56 *ARCE, 1881*, p. 1174.

57 Ibid., p. 1175.

58 Ibid., pp. 1177-78.

59 *ARCE, 1888*, pp. 152-153.

60 *ARCE, 1889*, p. 178.

61 *ARCE, 1890*, p. 1628.

62 Ibid.

63 *ARCE, 1896*, pp. 1376-77.

64 *ARCE, 1902*, p. 1268.

65 *ARCE, 1906*, p. 347.

66 *ARCE, 1912*, p. 594.

67 *ARCE, 1914*, pp. 664-665.

68 *ARCE, 1918*, p. 852.

69 *Index to Reports, 1866-1912*, Appendix Q.

70 *ARCE, 1881*, p. 1190.

71 *ARCE, 1889*, p. 176.

72 *ARCE, 1890*, p. 1625.

73 *ARCE, 1896*, pp. 1341-42.

74 *ARCE, 1901*, p. 1768.

75 Lynn M. Alperin, *History of the Gulf Intracoastal Waterway*, (Fort Belvoir, VA: Institute for Water Resources, 1983), p. 11. Hereafter cited as *History, GIWW*.

76 Ibid., p. 12.

77 Ibid.

VII. The Western River Basins, 1865 - 1918

As stated earlier, the Mobile District as established in 1888 had boundaries based on the drainage systems of river basins in central and western Alabama and in central and eastern Mississippi. The principal western Alabama watershed comprises the Tombigbee River and its major tributaries, the Warrior and Black Warrior, which enter the Tombigbee at Demopolis, Alabama. The Noxubee, Sucarnoochie, and Sipsey Rivers are minor tributaries to the Tombigbee system. The Tombigbee and Alabama Rivers merge to form the Mobile River, which empties into Mobile Bay. In Mississippi, the Leaf River basin in the east and the Pearl River basin in the central portion of the state constitute major drainage systems for which Mobile District has been responsible. Although the Leaf River basin covers a large drainage area, the river never warranted extensive navigation improvements. The only significant improvements in the basin were focused in the lower part of the river basin on the Pascagoula River.

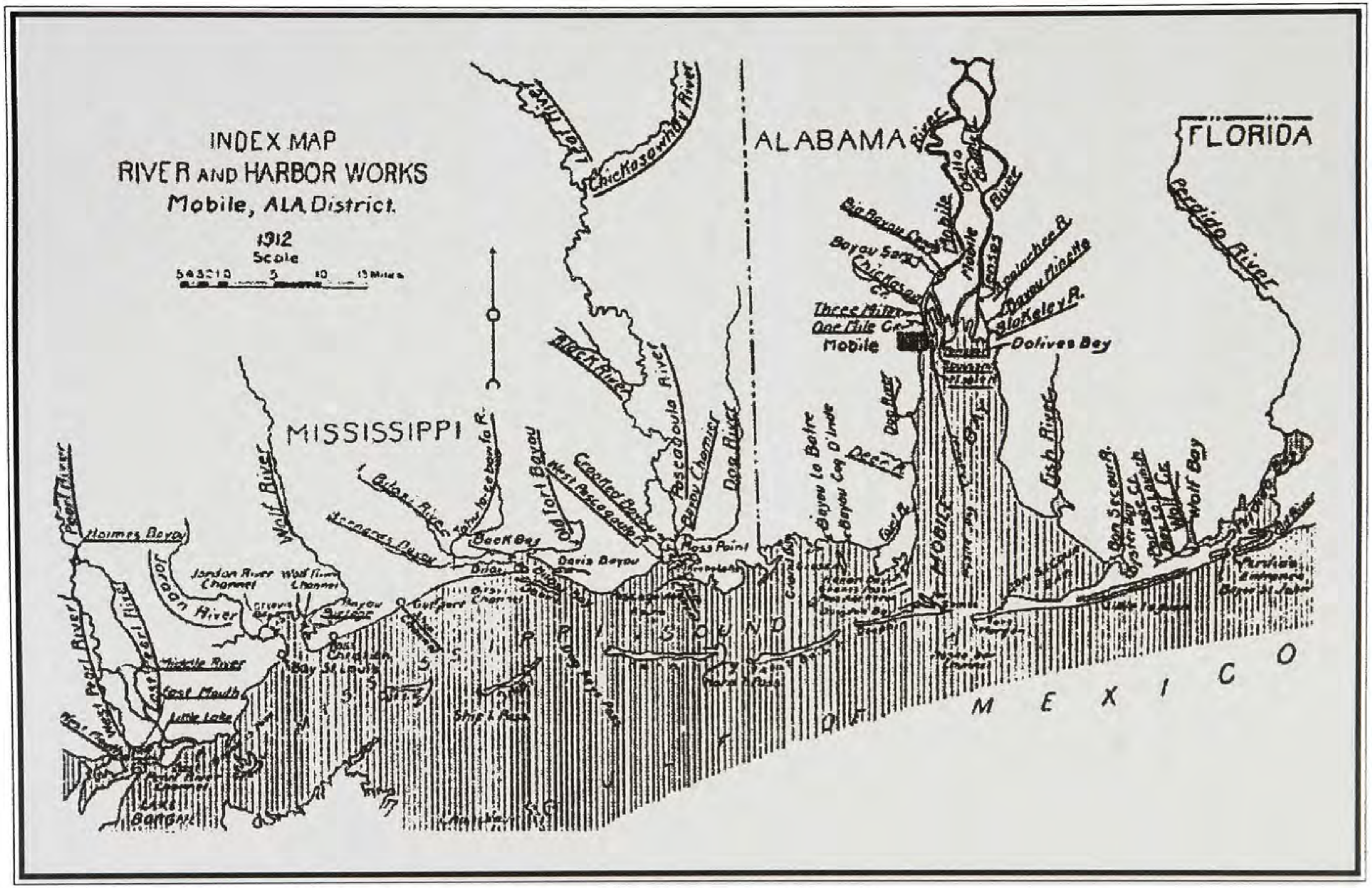
In addition to the major river basins, numerous harbors and bays along the coast westward from Mobile Bay came under the supervision of the Mobile District (Map 7-1). Mobile Bay is the District's most significant bay, but improvements were made to Biloxi Bay and Harbor, Pascagoula Harbor, and Gulfport Harbor as well.

Improvements in the interior river basins of the District were being carried out simultaneously with those along the Gulf coast. Interior improvements focused on removing snags and sunken logs, cutting back overhanging trees, and removing shoals and bars of sand or gravel. Where warranted and authorized by Congress, locks and dams were constructed on rivers with commercial activity to create slackwater navigation.

Projects on the Gulf Coast centered on harbors, although numerous examinations and surveys were conducted and operations undertaken to improve river channels along the coast. Improvements to coastal rivers did not include locks and dams because the topography was not suitable. Aside from snags and overhanging trees, the most common obstacle to navigation on coastal rivers was excessive sedimentation at the mouths of rivers and streams resulting from decreased stream velocity. Dredging was the primary means of opening up coastal rivers for commercial navigation (often to connect the lower reaches of a river with improvements already accomplished in the interior). Once opened, channels were marked with buoys or pilings to aid passage into and out of the harbor. Without channel guides, ships could veer off course and risk grounding (thereby causing silt to be shoved into the excavated channel). Harbor improvements also required additional structures such as jetties to counteract the erosive power of natural and navigation generated wave action. Wrecks were an additional problem. The increased ship traffic in harbors made shipping accidents more likely. The removal of wrecks from navigable waters was a national problem and the Corps of Engineers was responsible for remedying the problem in harbors and on inland rivers as well.[1]

The interval between the Civil War and World War I was an important improvement period for Mobile Harbor. Along with Pensacola, Mobile received most of the appropriations for navigation improvement. Funds were appropriated for years for interim improvements before a decision was made to improve the two ports permanently. During the same period, limited improvements were made to the Mississippi ports of Pascagoula, Biloxi and Gulfport.

The Mobile District also was responsible for coastal river and harbor improvements from West Pearl River, Mississippi, to Perdido Bay, Alabama.[2] Coastal examinations and



Map 7-1. Index map, Mobile District, coastal rivers and harbors, 1912 *(ARCE)*.

surveys were conducted to determine the feasibility of connecting various bays along the Gulf. Although Bernard and the Board of Engineers had in the early nineteenth century promoted the idea of a continuous inland navigation system along the coast, legislation authorizing an intracoastal waterway was not passed until the first quarter of the twentieth century. Nevertheless, the piecemeal work carried out by the Mobile and Montgomery Districts later became part of the Gulf Intracoastal Waterway.[3]

Mobile Bay and Harbor

Improvement of Mobile Harbor's channel was one of the earliest projects approved for the Gulf frontier. Appropriations were first authorized in 1827 and continued at irregular intervals until 1857, by which time more than $228,000 had been expended.[4] The original improvement called for a dredged channel ten feet deep through Choctaw Pass Bar and Dog River Bar. The channel across Choctaw Pass Bar was to be 200 feet wide; across Dog River Bar it was unspecified. Operations were discontinued during the Civil War and resumed in the 1870s under new rivers and harbors legislation.

Between 1857 and 1870, enough shoaling occurred to impair navigation and require additional improvements. Between 1870 and 1875, over $400,000 was spent widening and deepening the ship channel in a second stage of improvement. Channel width varied from 200 to 300 feet and depth was to be uniform at 13 feet, with the increases reflecting the needs of larger vessels.

A third stage of harbor improvement came in 1878 with a survey to determine the feasibility of further widening and deepening the channel to allow vessels drawing 22 feet of water. Results of the survey led to a decision to proceed with a previous plan that called for deepening the existing channel to only 17 feet. Funds were appropriated in 1879, but bid delays and inclement weather postponed project start until February 1881.[5] Appropriations over the next several years were applied to the operation before it was completed. Congress continued to make annual appropriations for improvements to the harbor, and by 1887 the channel had been increased to a minimum depth of 17 feet at low tide and a maximum depth of 23 feet. Width of the channel varied from 140 feet to 300 feet.[6]

Damrell's first year as District Engineer (1888), however, was not a productive time for harbor improvements; insufficient funding kept work to a minimum. Clustered pilings were erected to mark the dredged channel and the Corps concentrated on routine maintenance of boats and equipment. Work to improve the Gulf harbors was often mundane. Much time was required to remove the huge quantities of silt, mud, and sand, and thus create a channel deep enough for continuous navigation. For example, between 1879 and 1886 nearly 6 million cubic yards of sediment were removed from Mobile Harbor to create a 17-foot deep channel, at a cost of $750,000.[7] Prior to the improvements, vessels drawing more than 12 feet could not sail into Mobile. Instead, ships had to anchor in the lower bay, 28.5 miles from the city, where cargoes were transferred to smaller craft and transported to the city wharves. Port statistics provided by the Customs Service, indicate modest increases in the number of vessels using the port following each improvement to the channel. The latter years of Damrell's tenure as District Engineer and the beginning of Major William T. Rossell's marked the fourth stage in the improvement of Mobile Harbor. With the $750,000 appropriated between 1879 and 1886, the channel from the Gulf of Mexico to the city wharves had been deepened and maintained for a minimum of 17 feet at low tide. In 1885, a project was proposed for a channel 23 feet deep at mean low tide.[8] A two mile extension of the channel was proposed to pass beyond the city wharves to the mouth of Chickasabogue

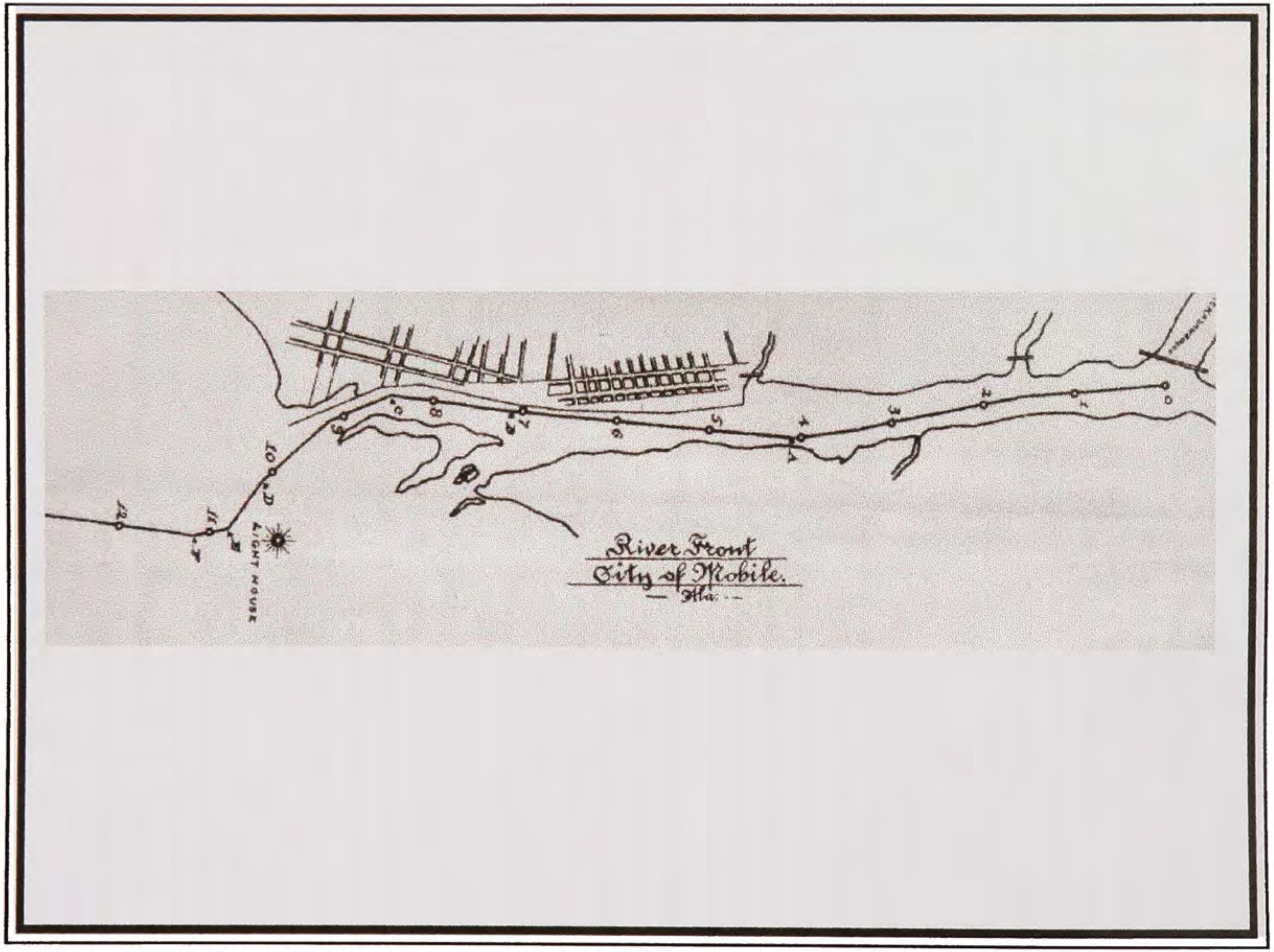
Creek. The project was approved, initiated in 1888, and essentially completed by 1895 at a cost of $1,993,800.

The work on the fourth improvement stage was divided into two parts. The first part covered the mouth of Chickasabogue Creek to the mouth of the Mobile River; the second part covered the mouth of the river to deep water near Fort Morgan. More than 16.5 million cubic yards of material were dredged from the two sections.[9] Shoaling was a constant problem. Wave action, as well as ships hitting the side of the channel, kept causing the channel to fill. Nevertheless, vessels drawing 23 feet could still sail to Mobile. The District Engineer concluded that the soft fill deposition would continue to occur, and additional dredging was authorized. The National Dredging Company of Wilmington, Delaware, removed more than 1 million cubic yards of material between April and June 1896.[10] A map of the dredged channel as of 30 June 1896 shows 66 dredging stations. The channel was cleared using clam shell dredges. The work was performed on a 24 hour basis by two dredges, the *Bismarck* and the *Charles Forbes*. The former had a bucket capacity of 10 cubic yards and could remove in excess of 11,000 cubic yards of material in 24 hours; the latter had a 5-cubic-foot bucket and could handle 9,000 cubic yards in the same period. Once the operation was completed, state law mandated that the harbor master and port wardens maintain the channel.[11]

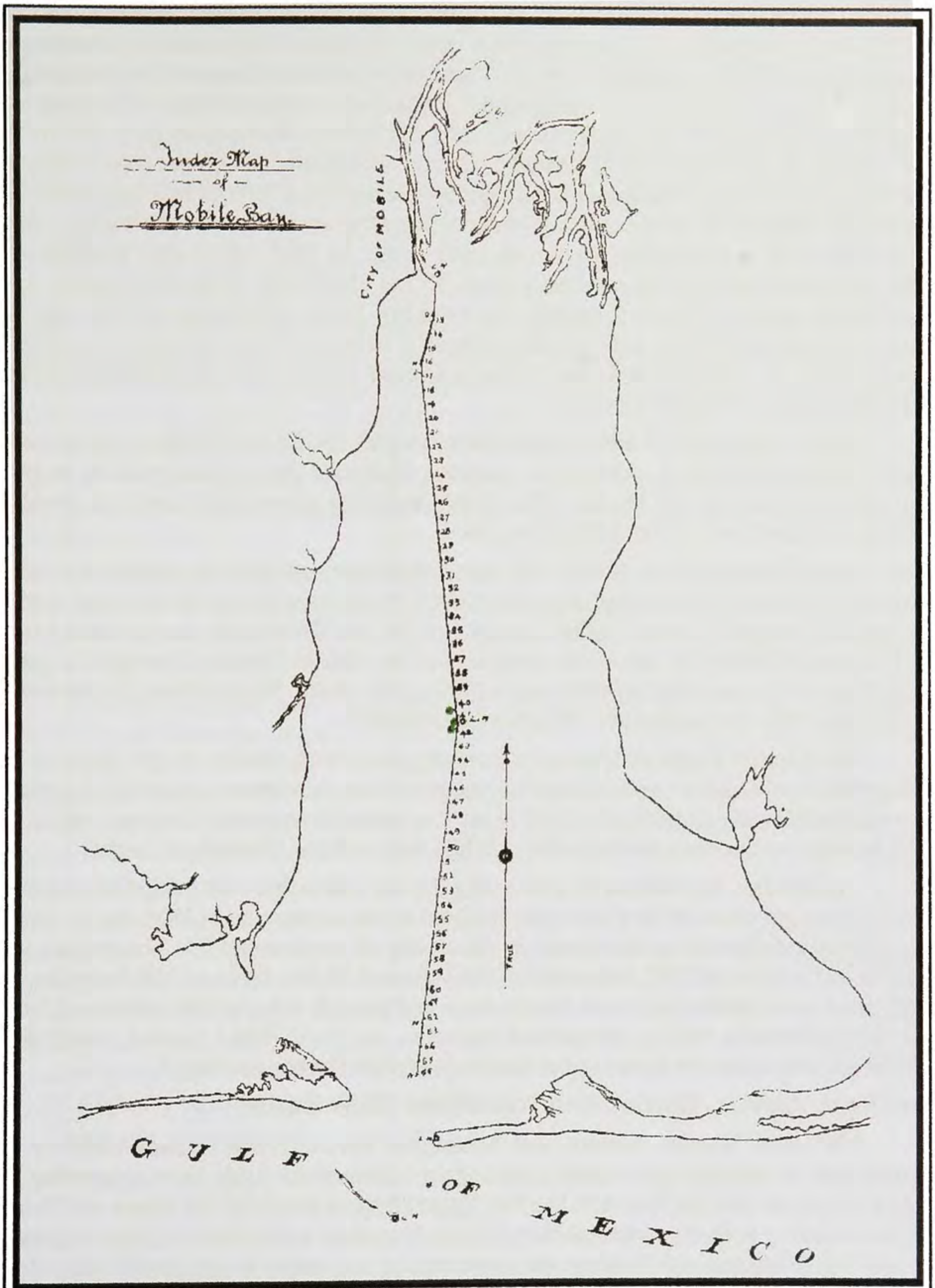
Imports at Mobile increased substantially following the fourth stage of improvement (i.e., by 140 percent in 1894 1895 and by 32 percent in 1895 1896). Newly introduced trade with Central America and the West Indies began supplanting that previously conducted with England.[12] In addition, exports from Mobile increased and the accommodation of larger vessels opened new global markets for the city. Iron manufactured in Birmingham began moving through Mobile on its way to England and other European ports and to Japan as well.

The Corps' positive relationship with the civic and business leaders of Mobile was attested to in a letter from A. C. Danner, submitted with the *Annual Report* for 1896. Danner praised the Federal government for its interest in developing Mobile as a port of national importance, and lauded the Corps for the "splendid success of the work which has been carried on up to this time with such conspicuous intelligence."[13] Local authorities were not hesitant to express their desires to the District Engineer. The need for commercial improvement could be expressed best by those directly involved in trade, and recommendations were submitted regularly to the District Engineer's office. In 1896, for example, Mobile's business community requested that the ship channel be widened again to accommodate larger ships, and that it should be extended above the mouth of Chickasabogue Creek where most of the lumber and timber boats lay while loading.

A fifth stage of improvement was initiated in 1899 and involved dredging the channel to a minimum depth of 23 feet at low tide. City officials and business had requested this new improvement in 1896, which included the channel from Chickasabogue Creek to the entrance of the bay. Maps submitted with the *Annual Reports* indicate that the channel was dredged and maintained in the two sections originally established (Maps 7-2 and 7-3).[14] Congress approved an additional preliminary examination and survey of Mobile Harbor in June 1900 to determine the feasibility of achieving a channel 300 feet wide across the bar at the mouth of Mobile Bay below Fort Morgan. Mean depths were to be 25 and 35 feet, respectively. The Rivers and Harbors Act of 1902 provided for work to widen and deepen the channel through the outer bar at the mouth of the bay.[15] It was believed the improvement would benefit commercial navigation in general and provide safe anchorage for coaling operations in the lower bay, including during wartime.[16]



Map 7-2. River Front, City of Mobile, dredging stations beginning at Chickasawbogue [sic] Creek, 1900 *(ARCE)*.



Map 7-3. Index map, Mobile Bay, 1900. Points J, K, and L indicate the junction of two dredging operations *(ARCE, 1900).*

The fifth stage of work in Mobile Bay was organized into three phases: (1) creating the 23-foot-deep channel, (2) removing obstructions from the harbor, and (3) dredging on the outer bank. The first two phases were completed on schedule; however, by the spring of 1903 no work had been done on the outer bar for lack of a suitable dredge. The snag boat *Tombigbee* was assigned to remove sunken logs and similar obstructions from the Mobile River, but each winter new debris floated down and necessitated additional costly snagging operations. Other snag boats used intermittently were the *Black Warrior* and the *Demopolis*. Inadequate equipment was a recurring problem and affected all District operations. Work initiated in 1899 continued for the next several years. In 1905 yet another proposal was made to deepen the ship channel, this time to 27 feet. Snagging work continued as usual and some progress was made in dredging the outer bar. However, the latter activity was still subject to numerous delays and setbacks, primarily because of bad weather or equipment failure. That same year the outer bar project was separated from the general improvement and maintenance of Mobile Harbor.[17]

At the outset of the harbor improvement project, the District Engineer submitted a request and justification to purchase a sea-going hydraulic dredge that could be used to maintain a channel through the bar. The dredge would be government plant and could be used at other Gulf ports in the Mobile Bay area.

Work continued at the Mobile Bay bar each year except for when inclement weather thwarted operations. The dredge then was moved to the lower end of the bay and used to maintain the shipping channel in that vicinity. In 1913 the *Charleston* was purchased from the Charleston District for use on the outer bars of the Mobile District. Through the years, much time and money was expended on repairs to this plant. Nevertheless, by the end of Fiscal Year 1913, the project was 99 percent complete.[18]

The District Engineer concluded correctly that work similar to that done on the Mobile Bar would have to be done at other bay mouth bars as commercial activity increased between Mobile and ports along the Gulf coast. One example was when Congress authorized work to improve the channel connecting Mobile Bay with the Mississippi Sound.

The strategic importance of connecting the bay and sound was recognized from the District's earliest years. Minor work was initiated on the connection in 1828, but no record was maintained describing the extent or the results of improvement.[19] The project was reactivated by an act of 1912 and provided for a channel 10 feet deep and 100 feet wide. Its completion was intended to lower freight rates and provide a better link between Mobile and New Orleans as well as the ports in between. As World War I loomed, nearly $8.5 million had been spent to improve navigation in Mobile Harbor and Bay.[20]

The Black Warrior, Warrior, and Tombigbee River Basin[21]

The Black Warrior, Warrior, and Tombigbee Rivers (BWWT) drain much of the western half of Alabama and a portion of eastern Mississippi. Aside from overseeing the improvements to Mobile Bay and Harbor, Damrell spent much of his tenure as District Engineer dealing with the numerous surveys and operations authorized for improvement of the BWWT. Congressional funding was more regular and ample for proposed works along this drainage system than for any other in the Mobile or Montgomery Districts.

Attention has focused on the Tombigbee River in recent years because of the massive engineering feat involved in achieving the long sought connection between the Tennessee River and the Gulf of Mexico. The development of the Tennessee-Tombigbee Waterway (the so-called Tenn Tom) began in the 1930s. Prior to that time, connection of the Tennessee and Tombigbee Rivers had garnered little support. In fact, attention focused on navigation improvements all along the BWWT system initially to aid cotton producers and later to facilitate coal shipment and development of the iron industry. Bringing river freight rates in line with those for rail transportation was another justification for navigation improvements.[22]

Surveys on the BWWT were authorized along with hundreds of others nationwide during the last quarter of the nineteenth century. The authorization and funding of surveys or projects was a multistepped process. An examination of a stream was intended to determine the feasibility of its improvement for navigation. The examination was followed by a survey, which served as a more thorough investigation. The survey would recommend precise routes for canals, locate the position and extent of channel obstructions, and determine specific sites for locks and dams. Based on the survey report, the District Engineer would make recommendations to the Chief of Engineers, which would accompany the survey reports, along with any other supplementary material. The Chief of Engineers presented the reports, along with projected costs, to the Secretary of War, who in turn submitted his report to Congress. Various congressional committees studied the reports before deciding which projects warranted development. Examinations and surveys sometimes were authorized together, sometimes separately. The next step, funding, followed a highly politicized period of decision-making.

Congress demanded rigorous accounting by the District Engineer, which was enforced by the Secretary of War through the Chief of Engineers. The simultaneous examinations and surveys in the District, and the fact that multiple projects were in varying stages of completion, required meticulous record keeping.

Timing of funding also complicated the District Engineer's job. The congressional budget year did not coincide with the best season for work in the Gulf region. By the time the Congress finished reviewing and selecting projects for funding, work could be delayed by inclement weather or health risks. As a result, some authorized projects were carried on the books for years pending sufficient funding to complete them as approved. The long interval before completion sometimes meant that new improvements were needed before any given project was completed.

Examinations and surveys often were conducted incrementally; that is, authorizations often were for river segments rather than for the entire length, however, funds appropriated for a particular project could be shifted within the District. If, for example, funds were inadequate to complete an examination or survey on the Warrior, the work crew and funds would be used to accomplish authorized work on the Tombigbee or Black Warrior Rivers. The same approach was used with funds appropriated for operations. *Annual Reports* show that the District Engineer exercised broad discretion in such matters.

The Robinson Survey

Congress authorized and funded a survey of the Tombigbee River between Fulton and Columbus, Mississippi, in 1872. District Engineer McFarland engaged Powhatan Robinson to perform a detailed survey, which got under way in October of that year. Because of inclement weather, the survey had to be postponed until the following spring. The survey was to ascertain the cost of establishing permanent low water navigation between Fulton and Columbus by providing a channel 60 feet wide and 2.5 feet deep.

Robinson found the river channel "covered here and there with shifting beds of sand and gravel ... banks are also unstable."[23] Although the river carried a considerable volume of water, the velocity in relation to the quantity was not enough to keep a channel clear over the rapids. Wing dams were not considered feasible because a shifting riverbed eventually rendered them useless. Robinson therefore ruled out dredging as a means of improvement. Slackwater navigation enabled by means of locks and dams was another option, but Robinson felt that locks and dams would suffer the same fate as wing dams. A survey of commerce on the river showed that the costs of navigation improvement could not be justified, and Robinson advised against the construction of any hydraulic works above Columbus or any attempts to enlarge the channel at low water by dredging or other means.[24]

Robinson was not opposed, however, to improvement for high-water conditions. He suggested that the simple removal of all logs, stumps, and other channel obstructions for a width of not less than 60 feet, and down to low-water level, would result in a high-water channel for three to five months each year. Such improvements would satisfy local demands for restoration of pre Civil War navigation conditions, and would give planters some relief from the discriminatory freight rates being charged by the Mobile and Ohio Railroad Company.[25]

Robinson's recommendations for high water navigation improvements were accepted and funds were appropriated in 1873 for the removal of snags, stumps, sunken logs, and trees from the riverbed. Overhanging trees were removed from banks and islands to facilitate navigation; tree limbs posed a particular threat to steamboat navigation because smokestacks were vulnerable to toppling and fire. Work parties were able to remove 60 to 80 trees per day as well as extensive smaller growth.[26]

Tennessee Tombigbee Canal Survey

The project associated most vividly with the Mobile District is the Tennessee Tombigbee Waterway, a combination inland barge canal and slackwater navigation system opened in 1985. The first survey for this waterway was authorized in 1874, and a survey to determine feasibility was initiated in January 1875. Powhatan Robinson, who had previously surveyed portions of the Tombigbee, was the Engineer in Charge. Topographic assessment suggested that the Tombigbee and Tennessee Rivers might be linked by a canal via Big Bear Creek, a tributary of the Tennessee emptying into the Tombigbee at Eastport, Mississippi.

The survey began at Eastport in Tishomingo County, at the mouth of Big Bear Creek. It revealed that the assumed location for the summit-level canal, on the divide between Big Bear Creek and the Tombigbee River, was actually higher than a known point to the north, along Big Crippled Deer Creek. After the preliminary reconnaissance was completed, the survey shifted to examine the northern site. The report concluded that slackwater navigation was possible along Big Bear and Big Crippled Deer Creeks, but would be impossible on the Tombigbee under present conditions.

The estimated cost of improving navigation by constructing the proposed canal was $1.7 million. Any scheme to connect the two rivers would require a detailed survey of the Tombigbee from its head to its mouth. Previous examinations of the river indicated that the high costs would not justify permanent improvement of the river.[27] Robinson was among the skeptics:

> I must confess that the merits of this enterprise are utterly beyond my comprehension. I can see good sound sense in spending a small amount of money in improving high water navigation of the Tombigbee, but this scheme presents nothing but incongruities in every aspect. These expensive hydraulic works, if executed, would give us, after all, nothing but a *wet-weather* canal, for it must be useless for *at least eight months in the year*. It has no national

> character, and therefore must rely solely on its merits as an investment. No capitalist would accept it as a gift, on condition that he should keep it in repair. Whence is the trade to come that will support it? During the short period of high water a few boats might go down to Fulton and get thence to Mobile as best they could; but I believe they would generally prefer to go down the Mississippi River via New Orleans.[28]

The next serious investigation into the possibility of a Tennessee-Tombigbee connection did not come until 1913. That survey was unfavorable as well. Congress did not receive a favorable report until the 1930s, when one of the most controversial chapters in the history of the Mobile District began to unfold.[29]

Other BWWT Surveys

A survey of the Black Warrior River was made in 1874 and a project to improve navigation was authorized in 1875. The intent was to clear a channel 80 feet wide and 4 feet deep at low water from the river's mouth up to Tuscaloosa. The improvement would involve clearing snags and other channel obstructions, cutting overhanging trees, and deepening bars through the construction of dams and wing dams and by dredging and blasting.[30] Appropriations were small but regular. Although the project commenced in 1875, by mid 1881 only 25 months of work on the river had been accomplished. The completed improvements still were subject to problems with bank caving and new drift brought down by freshets. Nevertheless, navigation was improved, as attested to by Damrell: "The benefits to commerce from the improvements already made are very marked, not so much in the increase of business done, as in the reduction of transportation charges."[31] Because the river had not been navigable year-round prior to 1877, particularly between August and December, rail costs to transport cotton downriver amounted to $2.50 per bale. Return rates were likewise high; a cask of bacon cost $12 to transport by return freight. Partial improvements allowed light draft boats to maneuver on the river at all seasons. As a result, rates for cotton dropped to $1 per bale and return rates for bacon to $3 per cask. Similar savings could be captured for groceries, bagging, ties, and other necessities. The community saved $25,000 to $30,000 annually over the previous years. Damrell felt that the investments in improvements to the Warrior had more than paid for themselves in rate savings.[32] While cotton and other agricultural products formed the bulk of trade, coal also became important in western Alabama in the last quarter of the nineteenth century. The largest and most productive coal fields in the state were the Warrior fields near Tuscaloosa.[33]

Improvements were sought as well for the Tombigbee River. Projects were approved in 1871, and modified in 1879, for improving the section below Vienna, Alabama. The objective was to provide a navigable channel with a depth of four feet at low water from the mouth of the river to Demopolis, Alabama, and a channel three feet deep from Demopolis to Vienna.

Although District Engineers had discretionary powers for disbursing appropriated funds, internal shifting of these funds to maximize operations was controversial. For example, some critics felt that the improvement below Demopolis was allotted a disproportionate amount of funding. As a result, work was suspended on that section in 1879 and shifted to the mouth of the Warrior.[34] The complaints may have related to increasing competition between agriculturalists and industrialists. Cotton was the most significant commodity moving through the Tombigbee Valley as efforts to maximize coal shipments along the Warrior and Black Warrior were increasing.

In 1878, Damrell assumed responsibility for the improvement of the Tombigbee River above Columbus, Mississippi.[35] He reported in 1881 that the channel had been cleared of all obstructions as a step toward realizing the high water navigation potential. While permanent improvement of the river was still considered impracticable, navigation conditions had improved and merchants along the river expected trade to increase by 30 percent. Immigration into the region was anticipated as well.[36]

Another survey of the BWWT system was authorized in 1879 for the Black Warrior River from Tuscaloosa to Sipsey Fork. Eugene A. Smith conducted the survey to assess the feasibility of improving the river for transporting coal by barge. Smith's 1888 survey was one of the first in the Mobile District that dealt with improvements that had a potential national impact. At the time, coal for the Gulf coast was transported from Pittsburgh. It was shipped down the Ohio River to New Orleans and then along the coast to the various settlements, including the naval depot at Pensacola. Unfortunately, supplies ceased whenever the Ohio was frozen, which jeopardized the Navy's ability to function properly. The Warrior fields were a source of good, cheap coal; improving the Black Warrior River would provide an all weather route to move the coal from source area to market.

The survey recommended construction of a series of locks and dams. The geography and geology of the Black Warrior basin meant that locks could be built against rock bluffs, which eliminated the cost of constructing one wall of each lock. In addition, timber dams, without stone fill as was standard technique, could be used because they could be bolted securely to a rock foundation.[37] The high estimated cost, between $750,000 and $1.2 million, was considered worth the investment.

A project to improve the Black Warrior River was authorized in 1886.[38] The land for lock sites was acquired in 1887, and plans were to commence with Lock No. 1 in 1888. One stipulation placed on the construction of the locks and dams along the Black Warrior was that "no work was to be undertaken upon any portion of the improvement where the purchase of land for sites, etc. would be required."[39] Land for Lock No. 1 and a lock tender's house (to be used as a temporary Engineer office) was deeded by the mayor and board of aldermen of Tuscaloosa to the United States in November 1887.[40]

In April 1888, Damrell proposed a change in improvements for the BWWT system. Previous improvements were intended to facilitate both the shipment of agricultural products to markets downstream and the upstream return of supplies. Experience had shown that if all navigation improvements were completed as authorized, they still would not meet the requirements created by new trade in the river basin. The coal and iron ore trade relied on water transportation and its vessels required greater depth and width.[41] To avoid reconstructing works already completed, Damrell recommended that the old projects be dropped and a new one be adopted. A minimum channel depth of six feet at low water and a uniform channel depth from Mobile to the Warrior coal fields was deemed essential. Improvement upstream on the Tombigbee to Demopolis, and a little farther upstream on the Tombigbee and the Warrior, could be accomplished by snagging, cutting overhanging trees, and constructing a system of chutes for passage over the bars.

The remaining distance up the Tombigbee River from Demopolis to Columbus, Mississippi, and up the Warrior River to Tuscaloosa, Alabama, would be improved by a series of locks and dams. Improvements on the Tombigbee from Columbus to Walker's Bridge was not suggested because the cost would significantly exceed the commercial return on the investment.[42] (The estimated cost for the Tombigbee improvements alone was nearly $3 million). As was customary, the District considered the three rivers as a unit because they formed one basin. No estimates, however, were offered for improving the Warrior. Damrell directed a preliminary survey of the Sipsey River in 1889 to determine how easily coal might be shipped along that route.[43]

Major William T. Rossell became District Engineer in 1896, following Damrell's retirement in 1895. At the time of Rossell's 1896 report, the first three of five locks and dams was completed on the Black Warrior. The locks were 322 feet long between the hollow quoins and 52 feet wide, affording an inside length of 285 feet. The first barge of coal started down the river on 12 January 1896 and arrived at Mobile on 30 January. Although the shipment was small, it was hailed along the entire route as the first visible sign of the future prosperity of the region.[44]

By 1896 the improvements to the BWWT system had been divided into five sections:

- Warrior River, from the mouth to Tuscaloosa, a distance of 130 miles
- Tombigbee River, from the mouth to Demopolis, a distance of 191 miles
- Tombigbee River, from Demopolis, Alabama, to Columbus, Mississippi, a distance of 156 miles
- Tombigbee River, From Columbus to Fulton, a distance of 144 miles
  Tombigbee River, from Fulton to Walker's Bridge, a distance of 24.75 miles

Routine operations involved removing snags and sunken logs, and cutting back overhanging trees. A system of locks and dams was approved for the Warrior, similar to those on the Black Warrior. Some dams and locks were approved as well for the Tombigbee above Demopolis.

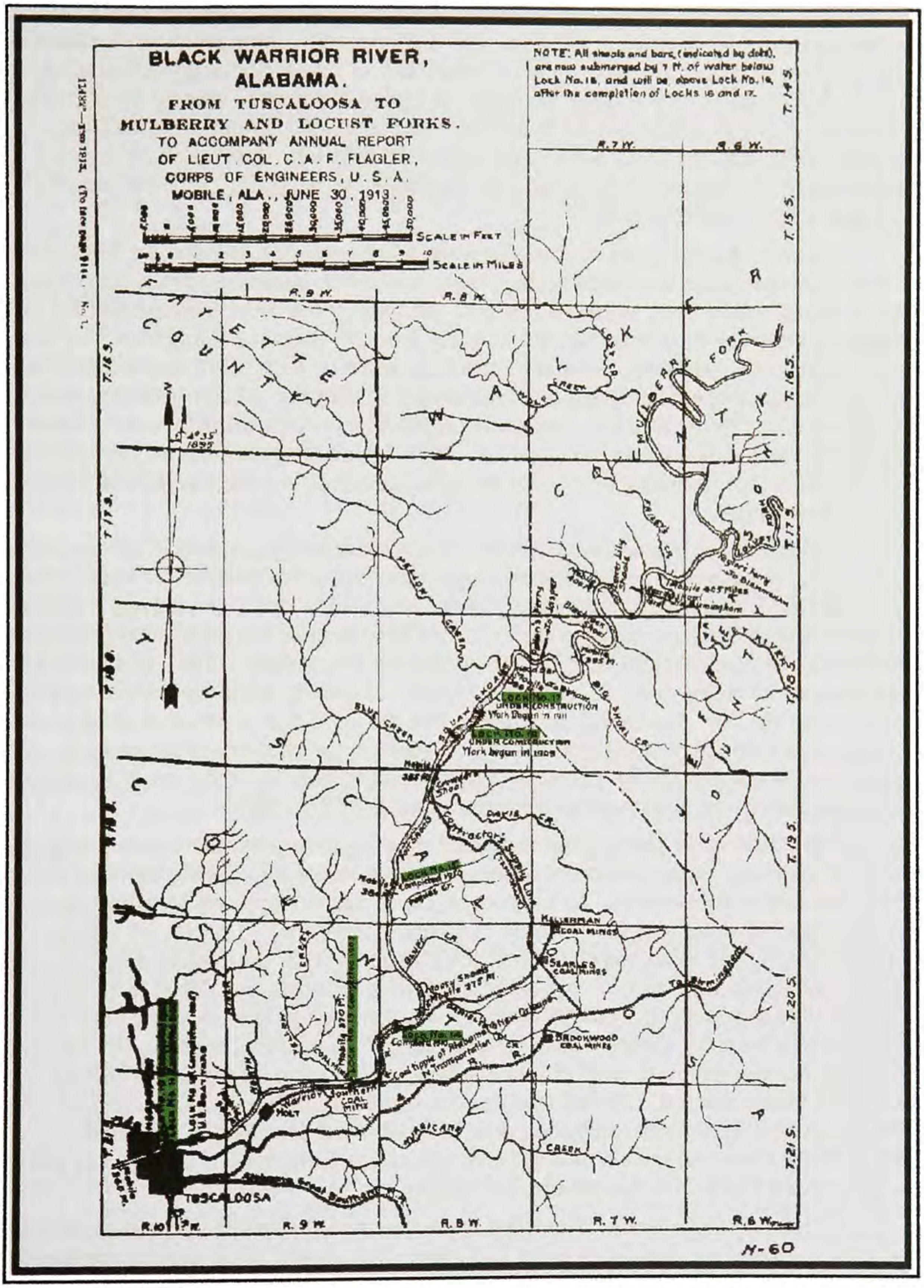
The first decade of the twentieth century brought important navigation improvements to the BWWT. A series of 17 locks was authorized; some were under construction and others were finished already (Map 7-4). Lock Nos. 1 through 4 were on the Tombigbee below Demopolis, Lock Nos. 5 through 9 were on the Warrior below Tuscaloosa, and Lock Nos. 10 through 17 were on the Black Warrior (Map 7-5).

The locks were renumbered once the overall project was organized. For example, Lock Nos. 1, 2, and 3 on the Black Warrior (the first to be constructed on the system) were renumbered to 10, 11, and 12, respectively. These locks were completed during 1895 and 1896. Construction of Lock No. 13 (formerly 4) begun in 1899, was completed in 1904 and opened for traffic on 4 July 1905. Lock Nos. 14 and 15 were began in 1907 and opened for traffic in 1909. Lock No. 16 was begun in 1909 and almost completed in 1911; Lock No. 17 was started in 1910 and finished in 1915. Construction activity on the Black Warrior was typical of lock construction along the BWWT during the early decades of the twentieth century.[45]

The Pearl River Basin

The Pearl River basin is located at the western edge of the Mobile District. Responsibility for basin improvement there shifted from the New Orleans District, under Major Amos Stickney, to Damrell in 1884. Improvement of this river basin was to be similar to that for the BWWT. Although impeded by the usual snags, fallen trees, and other channel obstructions, the Pearl River had problems aside from those plaguing development of the BWWT.

Map 7-4. Projected system of improvements of Mobile, Tombigbee, Warrior, and Black Warrior Rivers, 1902 (*ARCE, 1902*).



Map 7-5. Black Warrior River, Alabama from Tuscaloosa to Mulberry Fork, 1913 *(ARCE)*. The map shows the locations of Locks 10 through 17.

The Pearl River lies wholly within the Gulf Coastal Plain, which is formed from shallow sea deposits or from uplifted seabed. Consequently, there are no rock shoals or reefs to contend with. Instead, abundant quantities of suspended sediment in sluggish channels cause silting and shifting sandbars. A highly changeable channel configuration presented its own set of navigation problems. Appropriations for improvements began in the mid 1880s, and the Pearl River project was divided into three sections for ease of management: (1) between Edinburgh and Carthage, Mississippi; (2) from Jackson to Carthage; and (3) below Jackson.[46]

The worst section of the river was between Edinburgh and Carthage. On this section, no low water navigation was possible; high water travel was dangerous because the channel was so full of fallen trees, roots, and debris. Minimal funds were appropriated for this section of the river (less than $2,500 annually was the norm) and progress was slow. Navigation prior to Corps improvement was so impeded that even partial improvement had a dramatic effect. For example, steamers ascending the river prior to improvements averaged six days to cover the 24.75 miles. Following improvements the same trip took 12 hours.[47] Savings in freight rates were achieved as well. Before improvements, produce and merchandise had to be hauled by wagons between Edinburgh and various railroad stations, often 30 to 60 miles.

Recommended improvements to the 105 miles between Jackson and Carthage called for removing channel obstructions and opening a channel five feet deep at low water. When the original survey was made in 1879, the river was seven feet above low water and numerous obstructions went unseen. Consequently, the cost of improvement was greatly underestimated and insufficient funds were requested. The section was reexamined in 1887, and the cost of improvement increased from $21,000 to $29,000. However, additional funds were not forthcoming; the new assessment determined that no more than a two-foot channel was needed to accommodate the light traffic. Because appropriations were sporadic and insufficient to accomplish the necessary improvements, only the most troublesome and dangerous places were improved by the end of operations for 1888.[48]

For a number of years, improvements below Jackson were concentrated near the mouth of the river. Some tributaries of the river were sealed off, notably the West Pearl, which was totally unnavigable. As a consequence, stream velocity was increased through the East Pearl channel and troublesome sandbars disappeared. Despite all efforts, the improvements to the Pearl were not considered permanent by the District Engineer; the biggest problems continued to be bank-caving, shifting channels, and debris from freshets. Between 1884 and 1889 nearly 21,000 snags, roots, sunken logs and trees, and other debris were removed from the section below Jackson alone.[49] In addition, nearly 1,500 standing trees were cut and removed, over 18,000 overhanging trees were cut and/or removed, and over 2,000 trees deadened. Tons of sand and clay were dug and used to fill in jetties.[50] All of this mundane work made navigation possible year round for boats of light draft. Most important, the improved section offered better navigation between New Orleans and points along the Pearl River up to Monticello, Mississippi.

In the late 1880s, lumbermen called for increasing the depth of the passage over the bar at the mouth of the East Pearl River to 12 feet. This would allow them to use heavier and larger boats to carry more timber, a need brought on by the expanded demand in New Orleans and elsewhere. Bids were solicited for dredging the mouth of the Pearl River in 1893 and opened in March 1895. All were rejected because the costs were too high.[51] Operations along the Pearl River during the early twentieth century consisted of clearing obstructions from the channel, and maintenance of completed projects and government property.

Leaf River Basin

Much of the southeastern corner of Mississippi is drained by the Leaf River basin. The major streams include the Leaf River and its tributaries; the Pascagoula River (formed by the merging of the Leaf and Chickasahay rivers); and Black and Red Creeks, tributaries to the Pascagoula River. Except for the Pascagoula, only minor improvements were made to any of the streams in this basin. The chief problem with navigation on the Leaf and Chickasahay Rivers was obstruction from debris.

Chickasahay River

This river was so obstructed with debris that navigation was all but impossible.[52] The river was surveyed by Powhatan Robinson in 1879 and Damrell sought to improve the channel by removing obstructions to achieve a three-foot channel navigable during high water. Between 1890 and 1904 more than 127,000 snags, logs, overhanging trees, and other obstructions were removed from the river.[53] Over 34,000 obstructions were removed in 1896 1897 alone.[54] Once snagging of the entire river was accomplished in 1904, annual appropriations were requested to maintain the channel.

Commerce on the river focused on the transport of timber, both logs and sawn lumber, on rosin, turpentine, and staves; and on general merchandise. Freight was carried in the region by a railroad running parallel to the river and up to the head of navigation. The expectation was that opening the river would save the producers thousands of dollars annually in freight rates. However, 15 years of navigation improvement at a cost of nearly $30,000 had no effect on the rate structure.

Leaf River

A situation similar to that on the Chickasahay prevailed on the Leaf River in terms of commerce and the kinds of obstructions that impeded waterborne commerce.[55] The river had fewer obstructions than the Leaf River (the highest number removed in one year was 13,000), and the project was completed in 1897. Like the Chickasahay, navigation was restricted to the five months or so of high water.

Pascagoula River

Improvements to the reach of the Pascagoula from its formation by the Leaf and Chickasahay Rivers to its junction with Dog River consisted of the removal of snags and other debris. Prior to improvement, a bar blocked the river's mouth and allowed only boats with a three-foot draft or less to enter the channel. Behind the bar, the river afforded 6.5 feet of draft for a distance of about ten miles.[56] Navigation from this point to the river's juncture with the Leaf and Chickasahay was impossible.

Snagging operations were underway in 1902 and continued for several years. Improvements completed between 1902 and 1906 were offset temporarily by a major storm in September 1906, which filled the river with debris. Among the snag boats used to improve the river were the *Demopolis* and the *Escatawpa*. The major clearing work was concentrated in the river's lower reach, associated with the Horn Island anchorage and improvement of the channel up to the site of the lumber industries centered at Pascagoula.[57]

Other Mobile District Operations

Although considerable funds and energy were expended on the BWWT, improvement of Mobile Bay and Harbor was the largest single project for the Mobile District for decades.

By 1912, nearly $7 million had been spent to improve the Mobile Harbor; nearly $9 million had been spent on the improvements to the BWWT system. In contrast, the Pearl River basin had approximately $386,000 spent to improve navigation; streams like the Noxubee, Chickasahay, and Leaf Rivers had only a few tens of thousands of dollars invested in their respective improvements.[58]

While funds were disproportionately distributed across the District, priorities were based on need subject to justification and feasibility. The significance of the BWWT system and Mobile Harbor to the economic development of the region was always more critical than the collective development of lesser streams scattered across the District. Development of the coastal ports also was considered more significant.

Navigation improvements to ports other than Mobile were similar to those completed in the Montgomery District. Pascagoula Harbor, Biloxi, and Gulfport, Mississippi, were the primary beneficiaries. Of these, Pascagoula was the most significant. Some improvements were made as well to other Mobile District rivers emptying into the Gulf of Mexico. Coastal river obstructions were similar to those inland (such as snags, sunken logs, overhanging trees, sand- and gravel bars.) Hence, corrective measures were the same. An additional problem, discovered in the improvement of the Apalachicola River, was the creation of rivermouth bars where the river entered quieter coastal waters. Dredging was the customary means of navigation improvement.

Pascagoula Harbor

The improvement of Pascagoula Harbor was a multiphased project that included the Pascagoula River, Horn Island Harbor, and Horn Island Pass. Between 1827 and 1912 over $1.25 million was appropriated for the navigation improvements at these locations.[59] The first major improvement was authorized in 1878 and consisted of snagging and dredging the river to create a channel 7 feet deep and 200 feet wide in conjunction with the construction of a jetty on the west side of the channel. The original project was amended to dispense for the time being with work on a jetty and to cut a channel 7 feet deep and 200 feet wide across the bar at the mouth of the river and clear all obstructions from the river.

Attention focused on the problems Moss Point, then a thriving commercial site without adequate navigation to maximize industrial development. In 1881, Moss Point was the site of 13 sawmills, 1 glass factory, and 1 shoe factory. Between Moss Point and the mouth of the river, however, numerous lumps and shoals impeded navigation.[60] In 1886, it was proposed that a 12-foot channel be created from Moss Point to the mouth of the river, a distance of 11.5 miles. A new project was approved in 1896 that called for a dredged channel 12 feet deep from three miles above the mouth of Dog River to the 12-foot contour in Mississippi Sound. The channel was to be 150 feet wide above the railroad bridge at Scranton, Mississippi, and 300 feet wide downstream. In addition, the improvement to Horn Island Harbor called for dredging a channel in the anchorage to a depth of 20 feet and a width of 500 feet at low water.[61]

These projects were completed in 1902 and involved the removal of tons of material. Under the 1896 contract, 233,387 cubic yards of material were removed from Horn Island Harbor and 1,165,233 cubic yards from the Pascagoula River. Coastwise vessels drawing 12 feet of water could now pass with ease to the lumber mills upstream at Scranton and Moss Point and take on full cargoes there. Prior to the navigation improvements, lightering of loads was commonplace.[62]

A modification of the 1902 act approved deepening the 12 foot channel to 17 feet. Dredging operations on the expanded project continued sporadically, in an attempt to achieve the enhanced channel dimensions. In 1910, the project was modified again. The upper limit of the improvement was to extend a mile farther above the mouth of Dog River. The expanded project would provide a channel 17 feet deep and 150 feet wide from a point on Dog River four miles above its mouth; down the river and thence down the Pascagoula River to the railroad bridge at Pascagoula (formerly Scranton), Mississippi; and thence 17 feet deep and 300 feet wide to the deep water in Mississippi Sound.[63]

By the close of Fiscal Year 1912, the project was 85 percent complete. All of the improvements above the railroad bridge were finished and substantial progress were made on those below. Various other navigation improvements to the Pascagoula Harbor were authorized over the years, primarily to increase the depth and width of the channel.

Biloxi Harbor

Operations involved dredging to improve access to the city wharves, thereby connecting the port with Mobile via the Mississippi Sound. Early attempts to improve the harbor were hampered by insufficient and sporadic funding and by constant shoaling in the bay.

Improvements to the harbor ceased between 1892 and 1902, by which time the channel had shoaled along its entire length.[64] The new authorization was for a channel 8 feet deep and 150 feet wide from the Mississippi Sound to the city's wharves. The push for a 13-foot-deep channel was rejected by the Corps of Engineers. Because the government was improving Pascagoula Harbor to the east and Gulfport Harbor to the west, the Corps saw the need for no more than a minimal connecting channel at Biloxi.[65] Annual expenditures provided for little more than dredging to maintain previous improvements in the harbor until World War I.

Gulfport

Another significant navigation improvement along the Gulf was the channel from Gulfport to Ship Island Harbor, Mississippi. This improvement also included Ship Island Pass. The Rivers and Harbors Act of 1899 authorized the granting of a contract to dredge a ship channel to Gulfport and to create an anchorage in its harbor.[66] The channel was to be 300 feet wide and 19 feet deep at mean low water and was to extend from the anchorage at Ship Island Harbor to the city. In addition, the act authorized an anchorage of not less than 2,640 by 1,320 feet to be constructed along the Gulfport shoreline. The same act provided for excavation of a channel 26 feet deep at mean low water to be cut across Ship Island Bar.[67]

Gulfport was a much sought after and politicized deep water improvement. A special report submitted by District Engineer Rossell included testimonials from public officials and citizens. Central to the issue of improvement was the fact that the Gulf and Ship Island Railroad terminus was on the proposed channel. This also provided Rossell with an interesting legal question. The law creating the railroad had granted the company property rights over submerged lands in Mississippi Sound extending six miles in a southerly direction from the railroad's terminus and one-half mile on either side. From the Corps' point of view, this established the harbor line at six miles from the shore and it had "not been the custom of the United States to dredge channels or basins inside of the harborlines."[68]

A letter sent to Rossell from S. D. Bullis, General Manager of the Gulf and Ship Island Railroad, expressed the intense interest in securing Corps approval for the channel development. Bullis stated that the railroad was erecting dredging machinery in its steamer *Cape Charles* and would join with the Federal government in doing all the work necessary to create a safe harbor and a 21-feet-deep channel.[69]

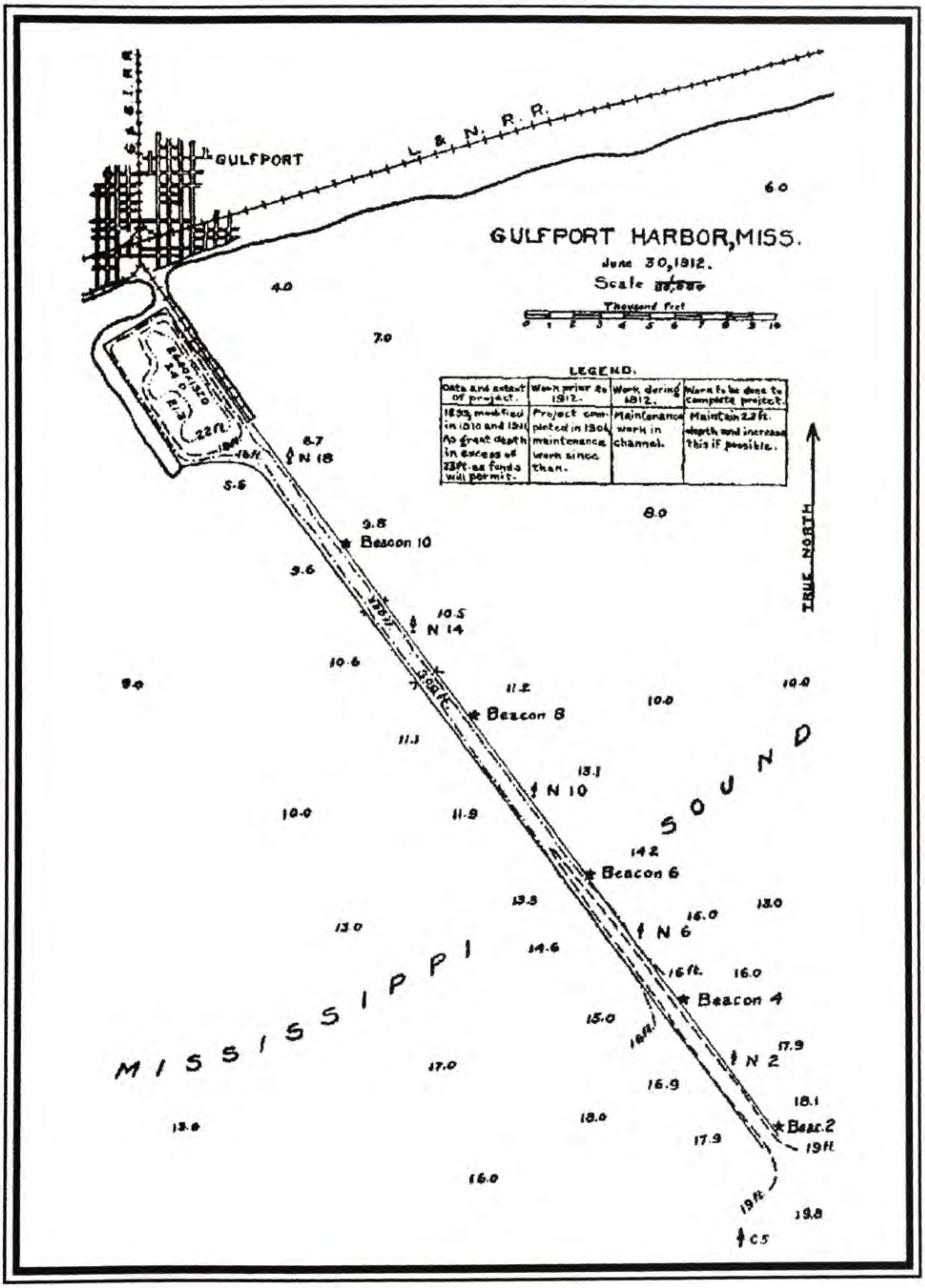
In the face of such strong public support, the project was approved and funds were appropriated. Ironically, operations were delayed for several seasons because no bids were offered. In the meantime, the National Dredging Company of Wilmington, Delaware, in March 1900 completed the excavation of the channel across Ship Island Bar.[70] Finally, in 1901, one bid was received when Mobile District advertised once more for improvements to the Gulfport channel. The bidder was none other than S. D. Bullis. He was awarded the contract with certain stipulations, mainly that the work would be completed within two years at a cost not to exceed $150,000. The work was to commence within 30 days of notification of award by the District Engineer. Although the contract was awarded without an appropriation from Congress, $1,000 was diverted from another fund within a few days after contract award so that preliminary work could begin. District reports to the Chief of Engineers for the next several years indicate that progress was satisfactory and funds were available for the improvement.[71]

Hydraulic dredge work on the anchorage basin began in April 1901. The hydraulic dredge was replaced by a clam shell dredge in June.[72] Monies were appropriated in 1902 and work continued, ultimately with three dredges operating more or less continuously.

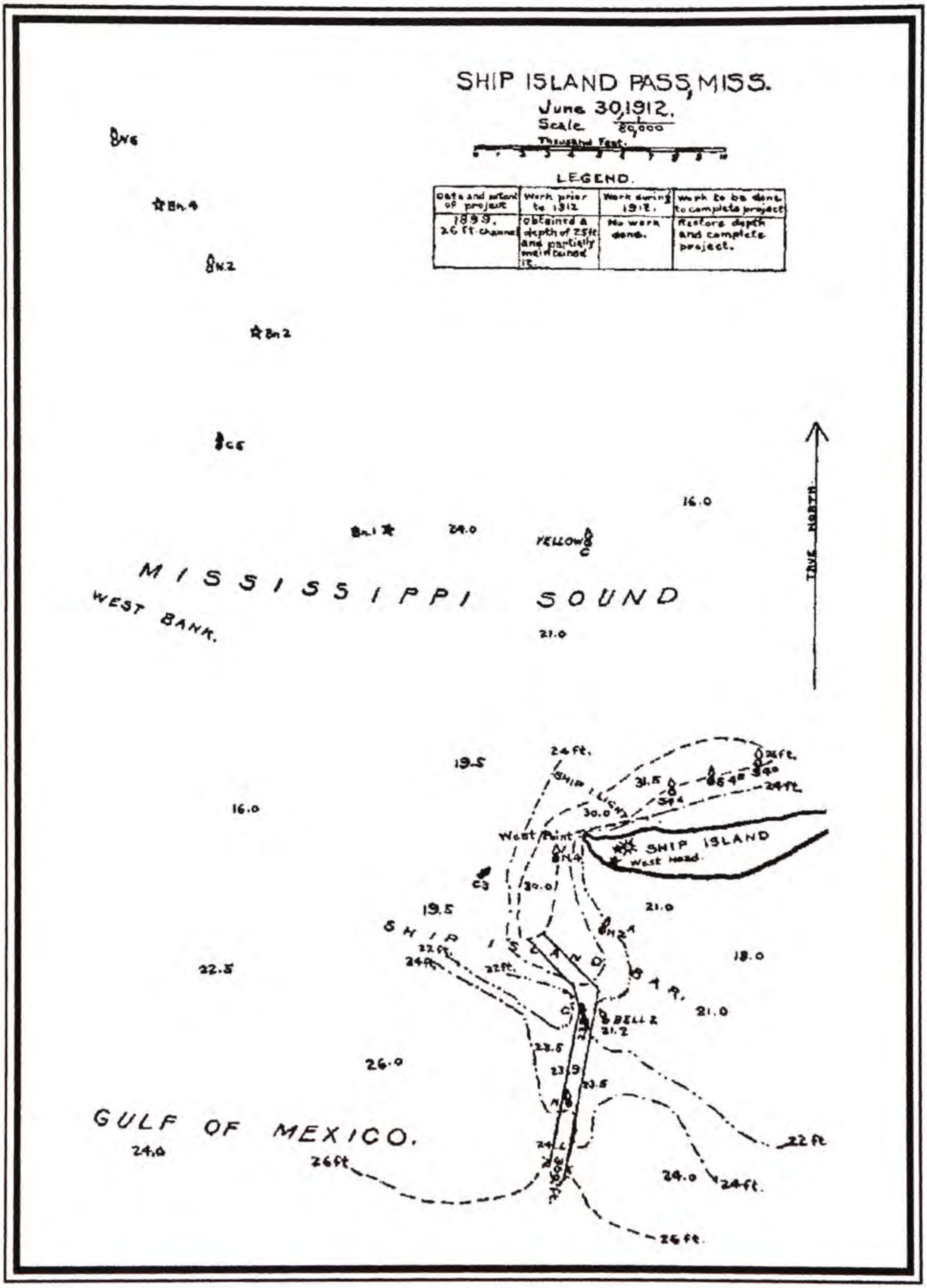
The dredging contract expired in 1903 but, because of difficulties encountered by Bullis, was extended for such period as "deemed reasonable" by the District Engineer. The channel was opened to most vessels drawing 20.5 feet; average channel depth varied from 21 to 25 feet. Major work had begun on the eastern half of the anchorage, but hardly anything had been done on the western half. The work was finished one month early (in July 1903), when the last grapple dredge was removed from the work site.[73]

The contract called for maintenance of the channel for five years following completion, with maintenance not to exceed $10,000 per annum. Periodic redredging of the central channel also was necessary to ensure a sufficient depth for final inspection. By June 1904, about 75 percent of the anchorage basin had been dredged to the specified depth; the channel varied from 18 to 28 feet deep. The contract funds were withheld until the exact dimensions were achieved.[74] In June 1906, the Corps declared the channel and anchorage basin completed according to specifications and Bullis was paid. The five year maintenance schedule commenced in June 1906 (see Maps 7-6 and 7-7).[75]

In 1907, the projects for the Gulfport basin and channel and the Ship Island Pass were consolidated.[76] Despite the efforts of Mobile District, the channels could not be kept open permanently. Some 60,000 cubic yards filled the Ship Island Pass channel annually, and 2.6 million cubic yards per annum shoaled the Gulfport Harbor and basin. Annual funding would be crucial in keeping these two channels open for navigation. Once the improvements had been accomplished, the District's efforts were directed almost entirely to maintaining the improvements, a situation that remained unchanged until after World War I.



Map 7-6. Gulfport Harbor, Mississippi, 1912 *(ACRE)*, a map of the completed channel.



Map 7-7. Ship Island Pass, Mississippi, 1912 (ARCE). A map of the completed improvements that were later combined with those to Gulfport Harbor.

1 The national magnitude of the problem can be inferred from the list of wrecks the Corps removed from navigable waters between 1866 and 1912. Some of these, particularly those in southern harbors, were casualties of the Civil War. Others were most likely the result of storms, collisions during bad weather, or the like. See *Index to Reports, 1866-1912*, pp. 2263-78. The index is informative as to the types of boats using American harbors at the time. Fourteen different types of boats are included.

2 For some time, the Montgomery District handled a few other rivers east of St. Marks River (the Aucilla, Enconfina, and Fenholloway rivers in Florida). These rivers were deleted later from Mobile's area of responsibility, presumably when the Mobile and Montgomery Districts were merged in 1933. Responsibility would have logically passed to the Jacksonville District.

3 *History, GIWW*, pp. 7-20.

4 *ARCE, 1881*, p. 1169.

5 Ibid., p. 1170.

6 *ARCE, 1887*, p. 159.

7 Ibid., p. 1194.

8 *ARCE, 1896*, p. 1427.

9 Ibid., p. 1428.

10 Ibid.

11 Ibid., p. 1429.

12 Ibid., p. 1431.

13 Ibid.

14 *ARCE, 1901*, pp. 1810-11.

15 *ARCE, 1902*, p. 1282.

16 *ARCE, 1901*, p. 1854.

17 *ARCE, 1905*, p. 1399.

18 *ARCE, 1913*, p. 671.

19 Ibid., p. 686.

20 *ARCE, 1918*, p. 869.

21 The designation Black Warrior, Warrior, and Tombigbee Rivers applies to virtually a single stream that originates in northern Alabama. For purposes of navigation improvement, the stream was arbitrarily divided into three section: a) the Black Warrior between the junction of the Mulberry and Locust Forks to Tuscaloosa, b) the Warrior River between Tuscaloosa and Demopolis, and c) the Tombigbee below Demopolis. The first improvements to the system were completed between 1915 and 1917. It continued to be referred to as the BWWT in the *Annual Reports* until 1963, although each report after 1915 treated the system as a single entity.

22 When the first suggestions were made to connect the Tennessee and Tombigbee Rivers, is subject to considerable speculation. Marquis de Montcalm, advisor to King Louis XV of France, was cited as stating the need for such a canal as early as 1770, possibly 1760. However, thorough search of the Royal Archives in Paris has failed to turn up any evidence that such a suggestion was made to the king. Citizens of Tennessee and Alabama did lobby for a Gulf connection, however, attention was focused more sharply on the possibilities of a canal to connect the Tennessee with the Coosa, not the Tombigbee. See William H. Stewart, Jr., *The Tennessee Tombigbee Waterway: A Case Study in the Politics of Water Transportation* (University, AL: Bureau of Public Administration, University of Alabama, 1971), p. 1.

23 *ARCE, 1873*, p. 549.

24 Ibid., p. 551.

25 Ibid., p. 552.

26 *ARCE, 1875*, p. 791.

27 Ibid., p. 805.

28 Ibid., p. 809.

29 James Kitchens' manuscript, "Tennessee-Tombigbee Waterway," is Volume I of the official history of the project up to 1971. The manuscript was completed in 1985 and currently is unpublished. A second volume on construction of the waterway is in preparation by a different contractor.

30 *ARCE, 1881*, p. 1204.

31 Ibid., p. 1205.

32 Ibid.

33 Coal transportation eventually became the prime justification for additional improvements to the system. Because coal mining was anticipated for the Coosa fields in the Montgomery District, and development of the Coosa River was sought to enhance access. The coal trade never materialized and improvement to the Coosa was eventually discontinued.

34 *ARCE, 1881*, p. 1209.

35 Ibid., p.1211.

36 Ibid.

37 Ibid., p. 1219.

38 *ARCE, 1888*, p. 160.

39 Ibid., p. 1198.

40 Ibid.

41 Ibid., p. 1227.

42 Ibid., pp. 12227-28.

43 *ARCE, 1890*, pp. 1722-24.

44 *ARCE, 1896*, p. 1433.

45 *Index to Reports, 1866 1912*, pp. 651 662. Also see H.C. Mower, "Locks and Dam No. 17, Black Warrior River, Alabama," *Professional Memoirs, Corps of Engineers*, Volume 7 (May June 1915): 307 332; G.K. Little, "The Transportation of Coal on the Warrior System," *Professional Memoirs, Corps of Engineers*, Volume 8 (1916): 301 319; and D.M. Andrews, "Foundations on the Coosa and Black Warrior Rivers, Alabama," *Professional Memoirs, Corps of Engineers*, Volume 1 (Oct Dec 1909): 333 354.

46 *ARCE, 1888*, pp. 164-166.

47 Ibid., p. 1217.

48 Ibid., p. 1220.

49 *ARCE, 1890*, p.1715.

50 Ibid.

51 *ARCE, 1896*, p. 1156.

52 *ARCE, 1901*, p. 1844.

53 *Index to Reports, 1866-1912*, pp. 668-669.

54 Ibid., p. 668.

55 Ibid., p. 669; *ARCE, 1901*, p. 1845.

56 *Index to Reports, 1866-1912*, p. 668.

57 Ibid., pp. 666-667.

58 *Index to Reports, 1866-1912*, pp. 646-678.

59 *Index to Reports, 1866-1912*, p. 664.

60 *ARCE, 1881*, p. 1215.

61 *ARCE, 1901*, p. 1842.

62 *ARCE, 1902*, p. 1305.

63 *ARCE, 1912*, pp. 627-628.

64 *ARCE, 1903*, p. 1264.

65 *ARCE, 1904*, p. 1849.

66 *ARCE, 1899*, p. xiii.

67 Ibid., p. 1723.

68 Ibid., p. 1790.

69 Ibid., p. 1803.

70 *ARCE, 1900*, p. 2217.

71 *ARCE, 1901*, p. 1847.

72 Ibid.

73 *ARCE, 1903*, p. 1268.

74 *ARCE, 1905*, p. 1424.

75 *ARCE, 1906*, p. 376.

76 *ARCE, 1915*, p. 785.

Part 3 - The Modern Civil Works Program, 1919-1985

VIII. The Mud-Pumping Era: Civil Operations, 1919-1939

Following World War I, the Federal government resumed its internal improvements agenda. For the Mobile District, the period between the wars has been referred to as the "mud-pumping era" because it was a period of uninterrupted navigation improvement in the District's rivers and harbors.[1] Between the early 1920s and the early 1930s, enabling legislation expanded the planning functions of the government's construction agencies. During this period, the Corps started producing "308 reports". The reports were plans for improving navigation in combination with power, irrigation, and flood control on selected streams. After the worst flood in the nation's history occurred in 1927, the Flood Control Act of 1928 called for a series of reports investigating tributary reservoirs as a potential means of flood control; the Corps believed reservoirs were the best way to control floods.[2] Reservoir construction became one of the Corps' most significant responsibilities until the post-Vietnam War period, and later was the focus of some of the most virulent criticism against Corps management of the nation's water resources.

During the New Deal era, water resources projects were seen as a mechanism for stimulating construction and thus providing critically needed jobs. New Deal planners stressed that all projects must be related to and coordinated with comprehensive plans for development of an entire river basin. A concerted effort was made to avoid "pork barrel" projects that could result in poorly planned and inferior structures.[3] During this period, Congress expanded the functions of the Corps.

The Flood Control Act of 1936 set into motion a national flood protection plan and gave the Corps jurisdiction over Federal flood control investigations and river improvements. In addition, a number of reservoir projects were approved for preliminary investigation and surveying. All of this fit neatly into the Corps' expanded responsibility as resulted of the 308 reports. The Corps was well on its way to taking the lead in nationwide comprehensive river basin planning with an emphasis on navigation and flood control.[4]

The Corps' expanded authority did not develop without opposition. During the early decades of the twentieth century, Congress and the executive branch were at odds over which governmental authority would control the Federal water resources programs. The two branches intermittently shared power and even had overlapping responsibilities, which only complicated matters. Increasingly, Congress took the lead in responsibility for oversight of the programs, and its preferred construction agency was the Corps of Engineers. By the beginning of World War II, Congress had almost complete control of planning agency programs. The war served to solidify its position. In the decades following the war, the four main construction agencies were the Corps of Engineers, the Bureau of Reclamation, the Tennessee Valley Authority, and the Soil Conservation Service. Of the four agencies, the Corps had the greatest geographical advantage because of its broad regulatory powers over the nation's waterways, powers that had evolved throughout the nineteenth and twentieth centuries. The Flood Control Act of 1944 established the Corps' governing policy for flood control and this area became the focus of Engineer activity; navigation improvement was relegated to second place.[5]

The responsibilities of the Mobile and Montgomery Districts increased as the Corps became the nation's premier construction agency. In addition to the "308 reports" (related to navigation, flood control, irrigation, and hydroelectric power development) other acts were passed that affected the Corps construction authorities as well. For instance, shore-protection responsibility was added in 1930, and various flood control acts in the late 1930s and early 1940s added responsibilities for water supply, recreation, and fish and wildlife management.[6]

The resumption of navigation improvement projects consumed most of the Districts' resources between the wars. The major activities within the two Districts focused on dredging, snagging operations, construction and repair of jetties, construction of dikes, dam construction, excavations for locks, and routine maintenance of completed projects.[7] Most of the navigation projects were initiated in the last quarter of the nineteenth century following a spate of rivers and harbors bills; new navigation improvement projects were reduced following World War I. The Districts also engaged in routine surveys, repairs to the floating plant, and occasional special projects (such as efforts to eradicate the water hyacinth, an introduced plant that clogged streams flowing into Mobile Bay).

Operations in the channels or rivers were not necessarily continuous. The *Annual Reports* for 1919 to 1932 indicate that certain rivers and harbors were designated as more important than others and funds were distributed accordingly. For example, within the Montgomery District the Chattahoochee, Alabama, and Choctawhatchee Rivers regularly received funding for improvement. The same was true of St. Andrew's Bay and Apalachicola Bay. On the other hand, except for annual funds for the routine maintenance and operation of the existing system of locks and dams, funding for improvement of the Coosa River was canceled in 1920. Only occasional money was allotted for work on Carrabelle Harbor, the Escambia River, and Pensacola Harbor.

In the Mobile District, the distribution of funds was widely dispersed geographically. Mobile Harbor, the BWWT system inclusive of its 17 locks and dams, Pascagoula Harbor, and Gulfport Harbor always received funding. Other rivers or harbors received sporadic appropriations. The lower portion of the Tombigbee, below Demopolis, received funds for the years 1920 to 1926 but not after that as a specific project. Funds for the Tombigbee above Demopolis were scarce except for an occasional small amount for snagging operations. The channel connecting Mobile Bay with the Mississippi Sound was dredged periodically to maintain a passable channel, as was Biloxi Harbor.

Certain rivers within the Mobile District, more than in the Montgomery District, received no funding for much of the 1919 to 1939 period; the state of Mississippi received the least support. The Leaf River was abandoned in 1916 as was the Pearl River below Rockport, Mississippi, in 1922. In 1919, the last year the Rockport segment of the Pearl River got funding, only $20 was spent and this was primarily to pay for commercial statistics.[8] The East Pearl received no funds prior to 1930 and the Wolf, Jordan, and Pascagoula Rivers likewise were poorly funded. In fairness to the Corps, however, funds were limited during the interwar period and justification for allocating monies had to be based on greatest use and benefit to the largest segment of the region. Some of the lesser streams and harbors in both Districts simply did not have enough commercial activity to justify the expenditure of funds.

Apalachicola-Chattahoochee-Flint Basin

Chattahoochee River

Navigation improvements within this basin focused primarily on the Chattahoochee River, although dredging and snagging operations also took place along the Flint and

Apalachicola Rivers. The Chattahoochee River was navigable for approximately nine months of the year but only for boats drawing less than 22 inches of water. A difficult and dangerous passage during the day, the river was impassable at night because of snags, shoals, and other channel obstructions. Work commenced in 1874 to improve the channel and by 1919 the project was 93 percent completed. In 1919 dredging by the U.S. dredge *Muscogee* and snagging operations by the U.S. snag boat *Chattahoochee* helped to open a channel from the mouth of the river to a point 161 miles above the mouth, with a low-water controlling level of 2.5 feet. Vessels drawing 2.5 feet or less could now use the river year-round and those drawing 4 feet could operate from January to August.[9] More than $1.4 million had been expended to improve navigation. All commerce on the river benefitted from the improvements; the principal commercial trade was in cotton, cotton seed, fertilizer, logs, manufactured iron and steel, and in miscellaneous agricultural products.[10]

Improvements on the Chattahoochee equalized freight rates for Columbus, Georgia, and other towns along the river. The chief rationale behind these improvements was to strike a balance between rail and water transportation rates. The effect was "favorable to Columbus, Eufaula, and other river points accessible by rail."[11] Despite improvements and the resulting benefits to commerce, progress was slow. In 1923 over 47,000 cubic yards of sand and gravel were removed, over a mile of jetties constructed and repaired, and nearly 1,200 obstructions removed from the river. Yet, the existing project was still only 93 percent complete; dredging remained to be completed at 24 bars and contraction works at 41 construction sites.[12] By 1928 contraction works were still needed at 38 sites; rock removal and dredging was still needed at 24 bars.[13] Expenditures to 30 June 1932 totaled more than $2 million; the chief commercial activity consisted of gravel and naval store shipments handled by boats and barges drawing an average of three to four feet of water.[14]

Flint River

Similar operations were conducted along the Flint River. Improvements to this river were authorized under the same legislation as the Chattahoochee, and by 1931 were nearly 98 percent complete.[15] The project goal was a channel 100 feet wide and 3 feet deep at extreme low water from the mouth of the river to Albany, a distance of 103 miles. The Flint was navigable up to Bainbridge, Georgia, a distance of 30 miles, but was impassable above that. Dredging operations by the U.S. dipper dredge *Upatoi* and other attending plant removed nearly 40,000 cubic yards of rock and clay in 1931 alone. The channel was now 70 feet wide and navigable to Albany for vessels drawing 2.5 feet of water or less. Vessels drawing four feet could navigate to Bainbridge year-round and up to Albany between November and June. Work to be completed consisted of dredging between Bainbridge and Albany to widen the channel from 70 to 100 feet and dredging various shoals.[16] Commercial activity on the Flint was considerably less than on the Chattahoochee and was restricted to the channel between Bainbridge to the mouth of the river. Naval stores and general merchandise were the principal commodities. The expenditure of over $1 million had at least reduced the freight rates as far as Bainbridge. In addition, the improvements served a major portion of the territory between Bainbridge and Albany, an area with no transportation facilities other than ridge roads.[17]

Apalachicola River

Snagging operations were conducted on this river for several successive years beginning in 1924. Some work was done in the frontier period but without defined project guidance. The 1920s project was initiated in the 1870s and called for opening a channel 6 feet deep and 100 feet wide at low water by removing snags from the existing channel and removing trees overhanging the banks.[18] The justification for operations was to achieve equity between water and rail rates, which was accomplished in this part of the Florida panhandle. The effects of rate reduction spread along tributary streams to reach far into Alabama and Georgia.[19]

The Apalachicola project was completed in the 1923-1924 work season. The U.S. snag boat *Flint* had successfully removed over 300 obstructions to the channel. In addition, some brush and pile jetties were completed. All traffic on the river benefitted from the improvements with the principal commodities being vegetable food products, naval stores, logs, and some sand and gravel on short hauls. The total cost for the improvements was slightly over $223,000.[20]

Choctawhatchee-Perdido River Basin

The improvements to the Choctawhatchee River were typical of routine operations for the Montgomery District. This modest river flows from the southeastern portion of Alabama through the Florida panhandle and into Choctawhatchee Bay, about 64 miles east of Pensacola. Work began as far back as 1833, but the existing project originated with the Rivers and Harbors Act of 1874 and was supplemented by modest appropriations thereafter.[21] The project provided for the maintenance of a navigable channel at low water for vessels to navigate to Geneva, Alabama, some 96 miles inland. An additional improvement calling for a channel 3 feet deep and 60 feet wide would allow commercial transport to Newton, Alabama, 44 miles farther inland. The project was completed in 1906 and since that time has focused on maintaining the channel. Typical efforts have included the renewal of several hundred feet of jetties, repair of jetties, removal of overhanging trees from the bank, and extraction of snags from the channel. The project cost over $400,000 to complete and required about $12,000 annually to maintain.[22] Dozens of small rivers and bay projects of this nature existed in both the Montgomery and Mobile Districts.

Alabama-Coosa River Basin

Coosa River

By 1919 the lock and dam at Mayo's Bar near Rome, Georgia, was completed, as well as Dam No. 5. Lock No. 4 was 99 percent complete (its dam having been finished).[23] However, commerce on the river never fulfilled expectation. Rate structures were affected by the improvements, but certain segments of the river had higher transport rates than railroad rates for shipment of comparable goods.[24] Minor dredging was done on the Coosa River until 1921, when all improvement was abandoned.

The real work of the Army Engineers was in the routine operation and maintenance of the completed lock system. Over $3.5 million had been expended on improvements on the river and a permanent, indefinite appropriation provided for in the Rivers and Harbors Act of 1909 ensured annual funding.[25] Maintenance throughout the interwar period included replacing wooden lock gates and fencing around the lock property, cleaning the interior portions of locks, erecting water towers, repairing residential and office buildings on lock sites, replacing or repairing guide piers, dredging entrances to locks, repairing dams, and painting lockhouses.[26]

Alabama River

This river is one of the major water courses in the state of Alabama. It was always navigable year-round, but improvements were expected to increase commercial traffic by providing a clear and deeper channel. Yearly appropriations have supported ongoing projects.

The current project on the Alabama was included in the rivers and harbors acts of the late nineteenth century. The river's improvement consisted primarily of dredging and contraction works at various obstructions, usually gravel bars.

At the end of 1919 the project was 83 percent complete.[27] Operations consisted of the construction of pile and brush jetties (contractions) and removal of tons of dredged material. Steady progress was made in succeeding years. Various segments of the channel were surveyed; dredging and contraction works at the shallowest bars and shoals were the chief improvements to navigation. By 1928, the project initiated in 1905 was 88 percent complete.[28] Rock jetties were constructed and significant snagging operations were carried out as well. The U.S. snag boat *Montgomery* removed over 3,000 obstructions between Selma, Alabama, and the mouth of the river.

Activity on the Alabama River intensified in the early 1930s. In 1931 the U.S. pipeline dredges *Blackwater* and *Muscogee* and the tow boats *Alabama* and *Georgia* were involved in a half dozen contraction works at bar sites between mile 146 and mile 188 above the mouth of the river. At these locations more than a mile of sand, rock, and gravel dikes were constructed or repaired. At the same time, the US snag boat *Montgomery* removed 2,300 obstructions from the channel.[29] Similar work was done during the 1931-1932 working season, at which time the project was 90 percent complete and had cost nearly $3 million.[30]

Bay and Harbor Projects (Exclusive of the GIWW)

The District also had specific responsibilities for bays and harbors along the Gulf coast. Although Pensacola Harbor was an important site, minimal dredging was carried on between 1919 and 1932. In addition, some minor jetty construction took place following storms. Apalachicola Bay and St. Andrews Bay were the most actively improved.

Apalachicola Bay

At Apalachicola Bay massive amounts of dredged material were moved annually to keep the channel open. The project, authorized in 1907, called for a channel across the bar at the mouth of the Apalachicola River not less than 100 feet wide and 10 feet deep at mean low water. An additional channel connecting the Gulf of Mexico with the bay through West Pass and Link Channel was abandoned in 1923 because improvements did not increase commercial use of the passage.[31] Later efforts focused on maintaining an open channel across the bar at the mouth of the river. Army Engineers felt that the improvements increased commerce in the area and that water and rail rates were equalized. The principal commodities were seafood, turpentine, rosin, and pulpwood. In addition, limited steamer service was made possible between Apalachicola and such locations as Carrabelle Harbor, Panama City, Pensacola, and East Point carrying passengers and vehicles.[32]

St. Andrews Bay

Operations at St. Andrews Bay were more intermittent than at Apalachicola. The original project in this area was authorized in 1910 and called for a channel 11 feet deep. The project was completed in 1914 but subsequent work was done to increase the depth of the channel from the Gulf of Mexico into the bay to 22 feet at mean low water and to increase the width to 200 feet.[33]

By 1920, improvements to St. Andrews Bay produced notable results. The increased depth allowed greater access to deeper draft vessels, which produced a corresponding rise in waterborne traffic. In addition to increased coastwise traffic, the foreign export of timber and lumber rose. Principal commodities included rosin, turpentine, and crossties.[34]

Shoaling was a major problem in the bay. Each year hundreds of thousands of tons of sediment were dredged to keep the channel open for ships of increasing draft. Value added by commerce began rising in the early 1930s with the construction of a paper mill and ship terminal at Bay Harbor, and the reopening of rail connections between Panama City, Florida, and Dothan, Alabama.[35]

The western river basins within the Mobile District were the focus of projects similar to those in the eastern basins. Five areas received the greatest attention: Mobile Harbor, the Warrior River system, the lock and dam system on the BWWT, Pascagoula Harbor, and Gulfport Harbor. Some dredging was done on the lower Tombigbee River. Improvements on the Leaf River were abandoned in 1916 and on the Pearl River below Rockport, Mississippi, in 1922.

Mobile Bay

Mobile Harbor

The original project for Mobile Bay and the river channels was adopted in 1826. Subsequent project expansions took place in 1870, 1888, 1899, and 1910. Prior to the adoption of a project in 1917, which continued through the interwar period, more than $7.5 million was invested in new work and maintenance.[36]

Millions of cubic yards of sediment were displaced from the bay each working season. The 1917 project called for a channel across Mobile Bar measuring 33 feet deep at low water, 450 feet wide, and one mile long. A channel 30 feet deep and 300 feet wide from deep water in lower Mobile Bay to Chickasaw Creek, about five miles above the mouth of Mobile River, was also approved. In addition, the project provided for the removal of obstructions from the channel.[37] During the season 2.2 million cubic yards of material were removed from the lower section of the bay and 3.2 million cubic yards from the upper portion of the channel. In addition, several hundred thousand cubic yards of material were removed from secondary portions of the channel, as well as 398 obstructions. By the end of the season, 9 percent of the project was completed.[38]

The Mobile Harbor improvement reduced rail freight rates, giving Mobile a competitive advantage in trading with the Atlantic ports. At the same time, a larger class of steamers could use the port and conduct coastwise shipping at competitive rates between Mobile and other Gulf cities. Principal commerce involved the transport of bananas, coal, oil, timber and lumber, and sand and gravel. Foreign trade was curtailed because of unsettled conditions in the world market due to the war.[39]

Routine dredging operations were carried out in successive years. In 1920 the project was 18 percent complete; by 1923, the figure reached 25 percent. Among the floating plant some of the following vessels were used: the seagoing dredge *Charleston*, the U.S. tug *Chickasaw*, the U.S. dredges *Wahalak* and *Pascagoula*, and the U.S. derrick boats *Demopolis* and *J.M. Pratt*.[40] The project was completed in July 1926; the monies expended for all projects as of June 1927 totaled more than $10.7 million.[41]

Black Warrior, Warrior, and Tombigbee River Basin

The massive lock system on the BWWT was 95 percent complete in 1919, although it had been in use since 1915 (see Map 7-4). The entire system was navigable for tows 50 feet wide and drawing 6 feet of water when loaded.[42] Some annual dredging and snagging operations took place on the channel along with maintenance on the locks. Fishways also had to be constructed on some of the dams. The District's efforts included crib repair, strengthening of the dams, construction of laborers' quarters at lock sites, and completion of real estate transactions. For the years between 1919 and the merger of the Mobile and Montgomery Districts in 1933, maintenance tasks varied little.

Pascagoula Harbor

Pascagoula Harbor was important to the shipbuilding and timber industries. Improvement there was intended to promote advantageous freight rates and in turn to enhance commercial ties with the Atlantic and Gulf coast ports. The approved project was to create a channel through the outer bar at Horn Island Pass as well as deepen the channel into the harbor. In return for local interests providing public wharf space (acceptable to the Secretary of War), the Federal government would provide funding to deepen the channel over the outer bar from 3 feet at low water to 25 feet. This would allow vessels of greater draft to use the harbor and its facilities. All work, which totaled more than $1.3 million, had involved dredging.[43]

Gulfport Harbor

Operations in Gulfport Harbor in many ways mirrored operations and maintenance in Pascagoula Harbor. The original project for Gulfport Harbor was approved in 1899 but work did not commence until 1911, when a project for Ship Island Pass was in place. Gulfport Harbor's improvement called for the construction of an anchorage basin. The channel through Ship Island Pass was to be 26 feet deep and 300 feet wide. From the Ship Island anchorage to the Gulfport anchorage basin, the channel was to be 19 feet deep and 300 feet wide; the anchor basin would be 19 feet deep, 1,320 feet wide, and 2,640 feet long.[44]

Unlike other ports along the Gulf, Gulfport actively sought the harbor improvement. Monies were appropriated as evidence of intent by Mississippi, the county, and the city for maintenance of the facility. In addition, the Gulf and Ship Island Railroad invested more than $1 million in securing the contract to build and maintain the anchorage basin. The project was completed in 1924, and later appropriations were used for maintenance or for minor alterations to the depth and width of the channels as recommended by the Corps of Engineers.

By 1933, net expenditures on maintenance and operations for Gulfport Harbor exceeded $2.8 million.[45] (Expenditures for harbor maintenance often exceeded amounts expended on navigation improvement for river channels. This was because of the prevalent shoaling, or refilling, of excavated channels in shallow coastal waters).

Merging of the Districts

The forming of the national organization of Engineer Districts appears to be based on General Order No. 12, dated 3 December 1888. At that time the Chief of Engineers reorganized the Corps by establishing five Divisions for the administration of civil responsibilities (Figure 8-1).[46] The Division Engineer had overall responsibility for Engineer projects, plans, and construction. District officers would be responsible for the oversight of specific projects at the local level.

Under the authority of the order, the Chief of Engineers established a Southwest Division with Colonel Cyrus B. Comstock as Division Engineer. Among those Comstock supervised were two officers responsible for projects in what is now the Mobile District. Major Andrew Damrell supervised the activities of the Mobile District, which encompassed the western river basins. Captain Philip Price was in charge of the eastern river basins of what is now Mobile District, the area known as the Montgomery District.

HEADQUARTERS, CORPS OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1888.

GENERAL ORDERS
No. 12.

By direction of the Secretary of War, and in accordance with Paragraph 2475½, General Regulations of the Army, 1881, the following officers of the Corps of Engineers are hereby assigned as Division Engineers:

Colonel *George H. Mendell* as Division Engineer of the Pacific Division, which will embrace the districts at present in charge of Major *Benyaurd*, Major *Jones*, Major *Heuer*, Major *Handbury*, and Captain *Young*, Corps of Engineers.

Colonel *Henry L. Abbot* as Division Engineer of the Northeast Division, which will embrace the districts at present in charge of Major *Overman*, Major *M. B. Adams*, Major *Livermore*, Captain *Mahan*, Captain *Palfrey*, and Captain *Casey*, Corps of Engineers.

Colonel *William P. Craighill* as Division Engineer of the Southeast Division, which will embrace the districts at present in charge of Captain *Bixby*, Captain *Black*, Captain *Abbot*, Lieutenant *Fiebeger*, and Lieutenant *Carter*, Corps of Engineers, Mr. *S. T. Abert*, and Mr. *W. F. Smith*, U. S. Agents.

Colonel *Cyrus B. Comstock* as Division Engineer of the Southwest Division, which will embrace the districts at present in charge of Major *Ernst*, Major *Damrell*, Major *Miller*, Captain *Willard*, Captain *Price*, Captain *Taber*, and Captain *Fisk*, Corps of Engineers.

Colonel *Orlando M. Poe* as Division Engineer of the Northwest Division, which will embrace the districts at present in charge of Major *Stickney*, Major *Mackenzie*, Major *Ludlow*, Major *Allen*, Major *Davis*, Major *Quinn*, Major *Lockwood*, Captain *Ruffner*, and Captain *Marshall*, Corps of Engineers.

By command of Brig. Gen. CASEY:

Clinton B. Sears,

Captain of Engineers, U. S. A.

Figure 8-1. General Order No. 12, OCE, establishing the five Engineer Divisions, 1888 (Library, Chief of Engineers).

The transfer of authority from the Southwest to the Southeast Division, the interim moves of one or both of the Districts to a Gulf Division, and the subsequent establishment of a South Atlantic Division has not been chronicled accurately. The fact that the Montgomery and Mobile Districts were merged in October 1933 is more closely established.[47] General Order No. 6 (Figure 8-2), effective 30 September 1933, mandated the consolidation of the Montgomery and Mobile Districts. The property, records, and funds of the Montgomery District were to be transferred to the Mobile District.[48]

Prior to the merger of the Districts, General Order No. 4 dated 13 September 1933 authorized the redistricting of the United States for engineer procurement planning. Effective 1 October 1933, the Birmingham Engineer Procurement District peacetime headquarters would be at the District Engineer office in Mobile, Alabama. During wartime the procurement office would operate out of Birmingham and would be responsible for Zone 3 (Map 8-1), which encompassed a southern tier of states extending from New Mexico to the Carolinas and from Florida to Virginia.[49]

The merger of the two Districts coincided with major trends that expanded the national workload of the Corps. The principal change was a move toward multipurpose planning, a move that grew out of the authority to investigate rivers to determine "navigation improvement in combination with development of power, flood control and irrigation."[50] The authority vested in the 308 reports also gave the Corps considerable latitude in determining priorities for surveys, unless instructed specifically by Congress. These reports in turn served as the basis for water resources development throughout the period 1933 to 1941 and for the post-World War II era.[51]

Much of the national concern over multipurpose planning grew out of the catastrophic flood of 1927. President Herbert Hoover referred to it as "the greatest peacetime disaster in our history."[52] Although the Mississippi River basin was the focus of this national disaster, river basins throughout the eastern United States were affected as well. The flood heightened national concern over the destructive capability of large river systems and spurred discussion over how to manage the nation's rivers and who would be responsible for studying and taming the waterways. The Corps of Engineers became the chief Federal agency for accomplishing surveys of flood-prone river basins and for proposing plans to manage them.

The Mobile and Montgomery Districts had to deal vigorously with the impact of flooding on river basins within their jurisdictions. While the Districts experienced no major flood problems during the 1927 season, the area was beset by rampaging rivers in 1929. Basins in the Montgomery District were harder hit than those in Mobile's jurisdiction.[53]

A series of telegrams, principally between Major L.E. Lyon, Montgomery District Engineer; and Mr. James E. Turtle, Associate Engineer in charge at Fort Barrancas, Florida, convey the sense of urgency in responding to the emergency. The prompt action of the District Engineers and their assistants typified the Corps' rescue and aid efforts during times of crisis. The Montgomery District's efforts won the respect and admiration of the local community and were recognized by elected officials from both Alabama and Georgia. The governor of Georgia sent a telegram thanking Lyon for the offer of boats if needed, adding "Your thoughtful message is deeply appreciated at this time of distress and anxiety over flood conditions."[54] A letter from the general chairman of the Red Cross Relief Work that operated out of Selma, Alabama, stated the following:

> Such splendid help as was received from this Governmental Department naturally inspired greater confidence in our Government and creates a deeper

(G. O. 6)

WAR DEPARTMENT
Office of the Chief of Engineers
Washington, October 6, 1933.

General Orders
No. 6

Effective September 30, 1933, the Montgomery, Alabama, District is consolidated with the Mobile, Alabama, engineer district.

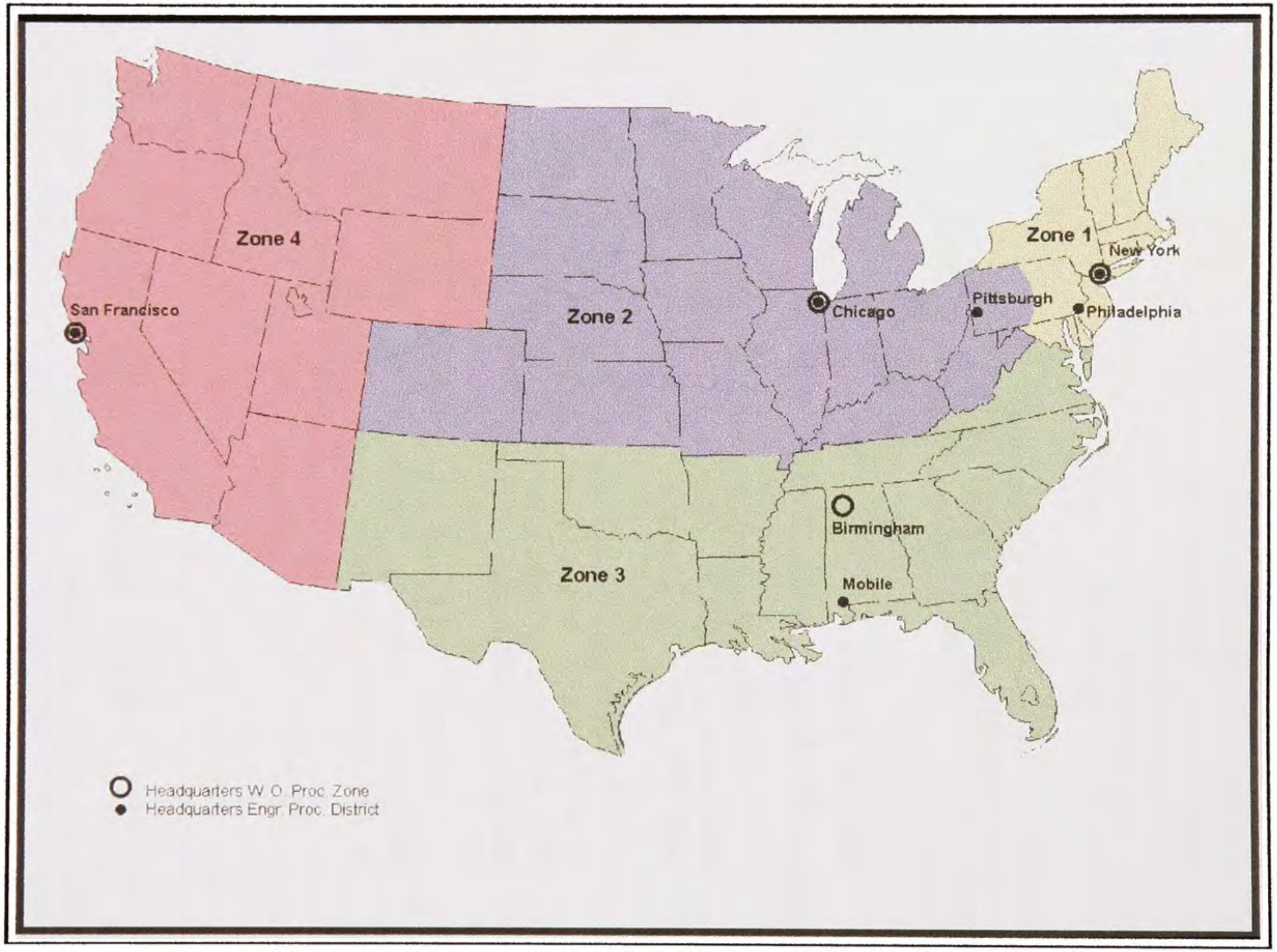
The District Engineer at Mobile, Alabama, in addition to his present duties, is charged with all work and duties assigned to the Montgomery, Alabama, District.

Property, records, and funds of the Montgomery, Alabama, District are transferred to the Mobile, Alabama, District.

By order of the Acting Chief of Engineers:

R. G. Barrows,
Major, Corps of Engineers,
Chief, Personnel Section.

Figure 8-2. General Order No. 6, OCE, consolidating the Montgomery and Mobile Districts, 1933 (Library, Chief of Engineers).



Map 8-1. Map showing the War Department Procurement zones and the Engineer Procurement Districts in the 1930s.

affection for it....Had it not been for the prompt response which we received from Maj. Lyon and for the willingness of the men of his Department to work day and night, there would have been much suffering by the people along the river.[55]

Another letter was sent to Major General Edgar Jadwin, Chief of Engineers from Lamar Jeffers, U.S. Representative from the 4th Alabama District:

> During the recent flood waters in the State of Alabama, at which time our citizens in the flooded areas suffered to such a great extent, the District Engineers in Alabama, with all the forces at their command, threw themselves wholeheartedly and without reservation into the relief work in all that vast stricken area. The held [sic] rendered by them was really worth more than can possibly be calculated, and I am writing this note to you because I want you to know that the citizenship of our State has appreciated the unselfish and highly efficient service rendered ....[56]

Disaster assistance has continued to be a major responsibility of the Corps. The hardest hit area of the Montgomery District was the southeastern corner of Alabama and southwestern Georgia. The Apalachicola-Chattahoochee-Flint basin was seriously affected as was the Choctawhatchee-Perdido basin. The Flint River caused considerable damage to the city of Montezuma, Georgia, where 40 buildings in the central business district were inundated.[57] The combined flows of the Chattahoochee and Choctawhatchee Rivers threatened to cut off Marianna, Florida, located between the two rivers and near their mouths. While the city was in no danger of flooding, it was feared that the Louisville and Nashville Railroad bridge over the Chattahoochee would be swept away during the night by rapidly rising water, leaving the city unable to receive foodstuffs for its citizens.

For Columbus, Georgia, farther up the Chattahoochee, this was the worst flood in its history; the river crested at 53.3 feet. Thousands were forced to flee their homes, and the city's gas supply was interrupted. Fort Benning was cut off from the city because of flooded Upatoi Creek. Although conditions returned to normal relatively quickly once the floodcrest passed, damage to property was considerable. Upstream from Columbus, the small town of West Point, Georgia, was inundated by floodwaters that reached up to eight feet in the business district.

Although the effects of the 1929 flood resulted in surveys seeking ways to alleviate future property damage, similar flooding occurred in following decades. Although some projects, or portions of projects, were approved and constructed in the 1930s, the Great Depression, followed by World War II and the Korean conflict, meant that many flood control projects were delayed for decades. Flooding occurred in the Alabama-Coosa basin in April 1938, causing damage to Rome (Figure 8-3) and to Prattville, Alabama, a few miles north of Montgomery. Selma, Alabama was flooded in 1971. West Point, Georgia, was flooded again in 1961 (Figure 8-4) and Columbus, Mississippi, in March 1973. Although construction of flood control projects on the major rivers considerably reduced property damage from rampaging rivers, the shift to multipurpose development projects in the major river basins was primarily a post-World War II phenomenon. The citizens of the Mobile District accrued enormous benefits from these multipurpose projects.

The Gulf Intracoastal Waterway

The construction of the Gulf Intracoastal Waterway was the major civil engineering project of the interwar period (Maps 8-2 and 8-3). Interest in a protected coastal waterway

Figure 8-3. Rome, Georgia, Oostenaula River flood, April 1938 (Public Affairs, MDO).

Figure 8-4. West Point, Georgia, Chattahoochee River flood, 1951 (Public Affairs, MDO).

Map 8-2. The Intracoastal Waterway, Gulf section, St. Marks to Pensacola, Florida, 1961 (MDO).

Map 8-3. The Intracoastal Waterway, Gulf section, Pensacola, Florida, to New Orleans, Louisiana, 1961 (MDO).

originated in the earliest national debates on the value of improving the nation's inland waterways; Albert Gallatin's famous document on roads and canals was delivered to Congress in 1808. Subsequent investigations, petitions, surveys, and other official documents broadened the scope of inland waterway improvements to include connection of inlets and bays along the U.S. coasts.

Some early projects on the Gulf frontier were precursors to the full-fledged development of the GIWW. For example, the first attempts to improve Pass au Heron in the 1820s related to connecting Mobile Bay with the Mississippi Sound as one way to protect coastwise shipping (the government later abandoned attempts to improve the pass). A private citizen, Captain John Grant, obtained a charter from Alabama in 1839 to improve a pass between Mobile Bay and the Mississippi Sound in return for the right to collect a toll. Slightly north of Pass au Heron, the "Grant's Pass," improvement illustrated the value of a passage between the mainland and the barrier islands rather than navigating through the more hazardous open waters of the Gulf of Mexico.[58]

Development of the GIWW had a slow start. The first recommendation for an inland coastal route in the Gulf region was the result of a survey undertaken in 1829 by General Simon Bernard and Captain William Tell Poussin. Aside from surveying for a connection between the Atlantic Ocean and the Gulf of Mexico, the two men surveyed a route for connecting St. Marks, Florida with Lake Pontchartrain.[59] Because Congress had little interest in developing an inland coastal waterway, no funds were appropriated to follow up on the recommendations of Bernard and Poussin.

During the early 1830s, Captain William Chase, who personified the Corps' image on the Gulf frontier, conducted or had others conduct a series of surveys examining the most feasible routes for connecting the bays and inlets of the Gulf coast, principally between Mobile and Pensacola Bays. Chase felt that connecting these two bays with the Mississippi Sound would improve Gulf commerce; the fact that the two bays were fortified would enhance frontier defense as well. The sparsely settled region had little political clout in Washington, hence no funds were appropriated to act on recommendations.

The question of an inland waterway was revived during Reconstruction, at which time New Orleans continued to be the major Gulf port handling most of the produce coming out of the nation's heartland. The longtime national interest in canals and inland waterways evolved in response to the need to connect agricultural areas with markets. The Atlantic seaboard cities became today's commercial hubs in part because of their linking to the agricultural interior with markets. Other southern cities wanted part of the prosperity accruing to New Orleans. In 1873 Savannah, Georgia, petitioned Congress to review whether it was still feasible to connect the Atlantic coast with the port of New Orleans via an inland waterway.[60]

The Engineers at New Orleans and Mobile were responsible for investigating the feasibility of a waterway; Captain William Damrell was in charge in Mobile. The Engineers' report confirmed the feasibility of a connection as desired by Savannah, stating that a channel 9 feet deep and 100 feet wide would accommodate first-class grain barges commonly in use at the time (such barges measured 40 feet wide by 220 feet long and could carry 1500 tons of bulk corn). The projected cost, however, would be prohibitive. Damrell estimated $7 million just for the segment from Mobile Bay to the Apalachicola River. Captain Charles Howell, New Orleans' District Engineer, also scoffed at the idea that Savannah could divert trade from New Orleans. Congress again refused to allocate funds for the project.[61] Despite the skepticism regarding commercial justification, both Damrell and Howell recognized the strategic importance of such a connection for defense. The military advantage of such an inland waterway would ultimately be one argument for its development. However, additional legislation authorizing another look at the proposed waterway was not passed until the early twentieth century.

The year 1909 was crucial for the GIWW. President Theodore Roosevelt, who championed the idea of a national inland waterway system, persuaded Congress to authorize a host of surveys to investigate the status of national waterways and to suggest improvements on a national scale. The legislation was a testament to Congress' recognition of the concept of a national waterways system. The sweeping legislation also authorized a system of inland waterways to connect Maine to Texas. Congressional authorization of the waterway, however, did not mean automatic allocation of funds.

Notwithstanding the political investigations and resulting feasibility studies, the real impetus for developing the GIWW came from a group of Texas businessmen.[62] The group wanted to connect the Texas and Louisiana Gulf coasts with the Mississippi River, and thus with the nation's heartland. Their persistence paid off; legislation in the 1920s provided for the construction of an inland waterway from New Orleans to Galveston, and a later extension of this canal westward from Galveston to Corpus Christi.[63] Eastern business interests began clamoring for the connection of their territory with the Texas-Louisiana waterway.

The authorizing legislation of 1909 and the modest appropriations in the rivers and harbors legislation of 1910 initiated the GIWW in the two Districts. However, the GIWW sections within the Mobile and Montgomery Districts were not completed simultaneously or entirely during the interwar period. Construction of the northwestern Florida section included the most hazardous work in the system. The area's swampy terrain subjected the Engineers and construction crews to mosquitoes, deer flies, water moccasins, rattlesnakes, alligators, and panthers. Rubber boots, guns, and snakebite kits were as essential as surveying equipment.[64]

Apalachicola to St. Andrews Bay

Congress appropriated $100,000 for the opening of a channel from Apalachicola River to St. Andrews Bay. The proposed channel began at Wetappo Creek and proceeded eastward via Searcy Creek and Wimico Lake to the Apalachicola River (see Map 8-2). While the region's geography had changed little since it was surveyed initially in the 1830s, commercially it was quite different.

Commercial development in the area had skyrocketed since the 1830s; the new population concentrations equated to those of the area today. The commercial history of the region is directly related to the development of the Apalachicola, Chattahoochee, and Flint Rivers. Dominated by agricultural products such as cotton, cottonseed, and cottonseed meal, and by timber products such as lumber, shingles, staves, and naval stores, residents sought improved navigation in order to compete more favorably with other southern areas. Commercial statistics for the decade between 1898 and 1908 indicate an 800 percent increase in value added by manufacture.[65]

The pressing commercial question, of course, was which port along the eastern channel would be the deep-water harbor. The ports of Apalachicola, Port St. Joe, and Panama City were all considered initially as possibilities. Apalachicola was eliminated because of the excessive silting caused by deposition from the Apalachicola River. Port St. Joe was too exposed to the Gulf and less accessible from the interior because it was hemmed in by swampy terrain. Because Panama City was located on relatively higher ground, it was chosen for development as the deep-water harbor for the eastern section of the future GIWW.

The initial channel was improved to a depth of 5 feet (most commercial coastal craft in the area were drawing 2 to 4 feet) and a width of 65 feet. In 1937, the channel was enlarged to its original specifications of 9-foot depth and 100-foot width.

Choctawhatchee Bay to Pensacola Bay

The same legislation authorizing improvement between Apalachicola and St. Andrews Bay provided for improvement of "The Narrows," the shallow connection at the eastern end of Santa Rosa Sound connecting the sound with Choctawhatchee Bay. Dredging began in 1910 to open a channel six feet deep across the shoals. Work was completed in 1912 and further improvement was not initiated until 1935, when the channel's dimensions were increased to the 9-foot depth and 100-foot width originally authorized for the entire Gulf section.[66]

Mobile Bay to Mississippi Sound

With work progressing on the two eastern sections of the inland waterway in Florida, attention shifted westward to the Grant's Pass area connecting Mobile Bay to Mississippi Sound. With increased railroad development between Mobile and New Orleans, this channel had fallen into disuse. By the 1880s increased trade in the area and improvements to Mobile Harbor reactivated interest in a viable connection between Mobile Bay and Mississippi Sound. Damrell concluded that an enlarged pass was "an absolute necessity."[67] He submitted a report in 1894 justifying improving either Grant's Pass or Pass au Heron to provide access through the pass. Not until 1912, however, did Congress authorize channel improvement. The channel passage through Pass au Heron was to be 10 feet deep and 100 feet wide, and it was completed in 1914.[68] In 1930, the channel width was enlarged to 300 feet.

Pensacola Bay to Mobile Bay

Following the interruption of civil works construction nationwide caused by World War I, interest in construction of the GIWW quickly revived and work resumed on the canal segment east of the Mississippi River. The connection of Pensacola Bay with Mobile Bay was surveyed in 1909; the principal justification was the speculative coal trade from the Warrior fields in Alabama via the Warrior River system to Pensacola.[69]

By 1929, the Warrior coal fields were not yet producing, but a new justification had been proposed for the canal. Projected commercial traffic was revised upward to 197,000 tons per annum, projecting a sizable annual savings of $130,000.[70] Although commercial estimates were purely speculative at the time (the 197,000-ton estimate was exceeded during the peak traffic period during World War II when more than 4 million tons of commerce were transported along the route), other factors argued in favor of a connection. The two bays were separated now by only 16 miles and their linking would be a logical improvement in the comprehensive inland waterway system along the Gulf. Furthermore, two extensive systems of waterways would be connected: Pensacola Harbor, the Escambia and Blackwater rivers, the Narrows, Choctawhatchee Bay, and the Holmes and Choctawhatchee Rivers to the east; and the Warrior-Tombigbee system to Birmingham with Mobile Harbor, Mississippi Sound, the Mississippi River system and inland waterways of Louisiana to the west.[71] In light of such compelling rationalization, Congress in 1930 authorized the connection of Pensacola Bay and Mobile Bay with a channel 9 feet deep and 100 feet wide.[72]

The channel followed Big Lagoon, Old River, Perdido Bay, Bay La Lanche, Wolf Bay, Portage Creek, Bon Secour River, and Bon Secour Bay. Work was performed under contract using hydraulic pipeline dredges. The construction of a jetty some 1,300 feet long on the south side of the canal where it entered Pensacola Bay eliminated excessive maintenance costs resulting from the scouring of the channel by strong tidal currents.[73] The channel was opened to traffic in 1934.

Mobile Bay to New Orleans

The Rivers and Harbors Act of 1930 authorized improvements to the canal between Mobile and New Orleans. Navigation through the improvements at Pass au Heron, however, was difficult. Some tows were in excess of 280 by 49 feet and groundings and collisions were frequent.[74] A channel 300 feet wide was authorized and both the enlargement and straightening were completed in 1933.

Channel improvement was being performed simultaneously at both ends of the District's coastal zone. In 1933, the western end of the channel was deepened to nine feet for compliance with the system measurements authorized for the canal's entire length. With completion of the improvements to the Mobile-New Orleans stretch and the completion in 1934 of the Mobile Bay-to-Pensacola Bay stretch, New Orleans and Pensacola were linked by a nine-foot channel. Within the Mobile and Montgomery Districts, only the reach from West Bay to Choctawhatchee Bay in the Florida panhandle interrupted what would be a continuous 345-mile inland channel of uniform depth between New Orleans and Apalachicola.

Choctawhatchee Bay to West Bay (Panama City)

Most of the GIWW was developed by using existing natural waterways, so dredging these natural channels to authorized depths and widths to accommodate anticipated commercial traffic was relatively easy. The major piece of equipment used was a hydraulic pipeline dredge. Dredges ranged from 15 to 25 inches in discharge size and were powered by steam and diesel engines ranging from 385 to 1600 hp.[75] Contractors also used draglines, power shovels, dipper dredges, and bulldozers.

In the absence of natural waterways, existing natural routes were connected by a land cut. The cut between Choctawhatchee Bay and West Bay (Panama City) was the only section in the Mobile District that required any special design features.[76] Problems posed by this land cut were not new to the Corps but were solved in ingenious ways.[77]

The land cut connecting the two bays began at the minus 10-foot contour in West Bay and increased gradually in elevation to mean sea level (MSL = zero-feet elevation) seven miles west of where the new channel left West Bay Creek.[78] From this point the ground elevation increased rapidly, reaching a maximum elevation of approximately 40 feet some 15 miles west of the starting point. For an additional four miles west, elevation remained near 40 feet. It decreased gradually after that point until MSL was reached where the channel entered Tucker Bayou at the head of Choctawhatchee Bay. The minus-ten-foot contour was reached some three miles out into the bay. Improving the bay sections on either end of the land cut was relatively simple. Work progressed from both bay sections toward the land divide. Contracts for the improvement were let to the Sternberg Dredging Company of St. Louis, Missouri, and the Shell Producers Company of Tampa, Florida. Sternberg's dredge *Duplex* worked westward from West Bay. Shell Producers' dredges *Punta Gorda* and *Tennessee* worked eastward from Choctawhatchee Bay. The dredges met severe obstacles upon reaching the land cut.

The land was composed almost entirely of sand, even to the minus-ten-foot depth required for the improvement. The unstable walls of the cut posed a dangerous situation. Near-vertical walls would collapse suddenly, exposing the dredge's front end to the danger of being covered with sand. Considerable time was lost backing the dredge up until the ladder could once again be lowered into the water to extract material.

The contractors and Army Engineers devised a simple and practical solution to the problem:

> After the dredges had advanced into the land cut a sufficient distance for the banks to be of necessary height to function as reservoir walls, a dam of earth was constructed across the channel and all water was discharged by the dredges, seepage water and water from natural drains was retained in the pools with the dredges. The dams and high banks acted as a lock chamber confining the water and raising the dredges to an elevation where the danger from caving material was negligible and the decreased lift from the pipeline to the shore made handling pipe to and from the shore and making shore connections much easier. The desired water elevation was obtained originally by pumping water from the channel behind the dams into the pools. The increased water level in the cut also prevented much of the bank erosion from discharge water returning to the channel that would have occurred if the water had been allowed to run down the high cut banks.[79]

Contractors removed the dams and allowed water on both sides to seek its natural level before making the final cut.

An additional problem with the West Bay-Choctawhatchee Bay cut developed because the improvement cut across several natural drains. Since the drains were now higher than the level of the channel, the channel banks at the drain sites began eroding immediately. Soon after the channel was opened to traffic in April 1938, it became apparent that some systematic means of controlling excessive shoaling at the drains was needed. After considerable study and experimentation, inlet control structures with connecting retaining levees were built to protect the banks.[80] Pools behind the levees served as settling basins and water was drawn from them to the canal through 48-inch asphalt-covered pipes. Maintaining the levees themselves presented problems. Ultimately, a type of local grass, Pensacola bahia, was found to be a suitable ground cover on the sandy soil.[81]

By 1937, the 345-mile canal was a reality. Only one small section at the extreme eastern end of the system, the stretch connecting Apalachicola Bay with St. Marks, remained to be completed; authorization was still on the books as of 1970.[82] Commercial development on the waterway exceeded most expectations, although increases in volume were gradual.

The strategic value of the GIWW was realized during World War II. Wartime demands for fuel considerably increased traffic on the GIWW. During the early stages of the war, a plan was devised for transporting all fuel from the oil fields of the Texas-Louisiana coast on large barges via the intracoastal waterway to Port St. Joe and Carrabelle, Florida, where it would go by pipeline to Jacksonville, Florida, and Chattanooga, Tennessee. From Jacksonville it could once more travel via barges on the Atlantic stretch of the intracoastal canal to the ports of Philadelphia and New York City. The strategic importance of the GIWW became evident when presence of enemy submarines in the Gulf threatened to disrupt oil shipments.

The increased oil demand for the war effort called for larger barges. The sighting of enemy submarines in the Gulf also meant that oil would have to be shipped within the protected channels of the GIWW; this necessitated enlarging the canal. Congress quickly authorized the channel's uniform increase to a depth of 12 feet and a width of 125 feet, except in open waters where the depth would be maintained at 150 feet.[83] Work on the channel expansion began in December 1942 and was completed in September 1943. The project was accomplished by private dredging firms in conjunction with the Corps of Engineers at a cost of nearly $3 million. Total cost of all work on the Mobile District portion of the GIWW was $5.8 million.[84]

The value of the GIWW for national defense alone justified its construction. In addition to the continued commercial value of the waterway, the year-round mild temperatures made it a favorite route for sports fishermen, pleasure boating, and yachting. In future years, tourism would continue to add to the economic importance of the channel through the Mobile District.

1 Louis. L. Knight, "The Mobile District: Reorientation to the Space Age," Unpublished manuscript, Public Affairs Office (Mobile, AL: U.S. Army Engineer District, 1968), p. 5.

2 Beatrice Hort Holmes, *A History of Federal Water Resources Programs, 1800-1960*, Department of Agriculture, Misc. Pub. No. 1233 (Washington, DC: GPO, 1972), p. 10. Holmes' work is a major summary of the government's role in the development of water resources programs. A companion volume was published by Holmes in 1979 entitled *History of Federal Water Resources Programs and Policies, 1961-70*, Department of Agriculture, Misc. Pub. No. 1379 (Washington, DC: GPO, 1979). These documents will be cited hereafter as *Holmes, Misc. Pub. No. 1233*, and *Holmes, Misc. Pub. No. 1379*, respectively.

3 *Holmes, Misc. Pub. No. 1233*, p. 13.

4 Ibid., p. 16.

5 Ibid., p. 26; see also Lt. W.C. Gribble, Jr., "Perspectives on the Army Engineers Water Management Mission," *Water Spectrum*, Volume 6, No. 3 (Fall 1974): 2.

6 U.S., Congress, Senate, Committee on Public Works, *Civil Works Program of the Corps of Engineers: Report to the Secretary of the Army by the Civil Works Study Board*. 89th Cong., 2d sess., 1966. U.S., Department of the Army, Civil Works Study Board (Washington, DC): GPO, 1966. See the section entitled "Historical Background," pp. 20ff.

7 The *ARCE* for each District's river basins was surveyed for the period 1919-1932; in 1933 the Montgomery District was absorbed into the Mobile District. The fiscal year operations and results for each river in the District index were scanned to produce an overall assessment of operations from which generalizations in this section are made.

8 *ARCE, 1919*, p. 956.

9 *ARCE, 1919*, p. 841.

10 Ibid., p. 843.

11 *ARCE, 1923*, p. 739.

12 Ibid., p. 740.

13 *ARCE, 1928*, p. 795.

14 *ARCE, 1932*, pp. 766-767.

15 *ARCE, 1931*, p. 853.

16 Ibid.

17 Ibid.

18 *ARCE, 1923*, p. 730.

19 Ibid., p. 731.

20 Ibid., p. 732.

21 *ARCE, 1932*, pp. 773-774.

22 Ibid., p. 775.

23 *ARCE, 1919*, p. 904.

24 Ibid., p. 906.

25 Ibid., p. 910.

26 Each *ARCE* describes maintenance performed at the various lock sites. The compilation in the text is a composite of selected items between 1919 and 1923. By 1940, only Mayo's Bar was being maintained actively, other locks were listed as "being protected." All of the locks needed repairs but none were contemplated.

27 *ARCE, 1919*, p. 900.

28 *ARCE, 1928*, p. 823.

29 *ARCE, 1931*, p. 889.

30 *ARCE, 1932*, p. 792-794.

31 *ARCE, 1922*, p. 854; see *ARCE, 1923*, p. 731 for recommendation to abandon the West Pass and Link Channel.

32 *ARCE, 1932*, p. 756.

33 *ARCE, 1921*, p. 849.

34 Ibid., p. 850.

35 *ARCE, 1932*, p. 772.

36 *ARCE, 1919*, p. 912.

37 Ibid.

38 Ibid., p. 913.

39 Ibid., p. 915.

40 Numerous types of floating equipment were used in the navigation improvement of Mobile Harbor. Names of vessels have been extracted from various *ARCE*s.

41 *ARCE, 1927*, p. 800.

42 *ARCE, 1919*, p. 922.

43 *ARCE, 1934*, p. 580.

44 *ARCE, 1923*, p. 812.

45 *ARCE, 1934*, p. 584.

46 Office of the Chief of Engineers, General Order No. 12. 3 December 1888. Authority for the issuance of this order is based on an order from the Adjutant General's office. See Adjutant Generals Office, General Order No. 93, dated 8 November 1888, giving the Chief of Engineers permission to assign Division Engineers.

47 An unpublished document roughly outlining the geographical organization of the South Atlantic Division appears to be historically inaccurate. The document indicates that the Montgomery District was formed in 1910 as a unit in the Gulf Division. This contradicts General Order No. 12, which established the five Engineer Divisions in 1888. Order No. 12 implies that the Montgomery and Mobile Districts were formed at the same time. Furthermore, RG 77, Entry 1258, Montgomery District, Miscellaneous Files, contains correspondence prior to 1910 that indicates that the

Montgomery District was already a recognized entity. Captain H.B. Ferguson was District Engineer from 1908 to 1910.

48 Ibid., General Order No. 6, 6 October 1933.

49 War Department, Office of the Chief of Engineers, Washington, DC General Order No. 4, 13 September 1933.

50 *Holmes, Misc. Pub. No. 1233*, pp. 10-12.

51 Ibid., p. 12.

52 F. Simpich, "Great Mississippi Flood of 1927," *National Geographic*, Volume 52, No. 3 (September, 1927): 245.

53 Documents in RG 77, Entry 1258, Miscellaneous File, Montgomery District, Alabama, consist of telegrams, interoffice memos, and other miscellaneous clippings and correspondence regarding the District Office's emergency assistance to local communities suffering from the effects of the 1929 flood. Although listed in the inventory as records from the Mobile District Office, all material relating to the flood was from the Montgomery District Office.

54 RG 77, Entry 1258, Miscellaneous Correspondence File, Mobile District Office, Box 485-A, Folder 310. Documents contain information about the operations of the two Districts during the 1929 flood. Telegram dated 16 March 1929 to Major Lyon from L.G. Hardman, Governor of Georgia.

55 Ibid., Letter dated 19 April 1929 to Lt. Col. Mark Brooke, Division Engineer, New Orleans, LA, from H.H. Frasier, General Chairman, Red Cross Relief Work, Chamber of Commerce, Selma, AL.

56 Ibid., Letter dated 6 June 1929 to Major General Edgar Jadwin, Chief of Engineers, from Lamar Jeffers, Representative, 4th Congressional District, AL.

57 "Span of Highway Bridge at Montezuma is Broken," *Macon Telegraph*, 18 March 1929. Unless otherwise noted, the details about flood stages, damage, and loss of life are taken from this lengthy article that appeared during the height of the crisis.

58 Virgil S. Davis, *A History of the Mobile District, U.S. Army Corps of Engineers, 1815-1971*, MDO, 1975, p. 61. See also Lynn M. Alperin, *History of the Gulf Intracoastal Waterway*, (Fort Belvoir, Va.: Institute for Water Resources, 1983), p. 8. Hereafter this document will be cited *History, GIWW*. The danger to small craft trying to navigate the open waters of the Gulf is stressed by Davis and implied by Alperin. U.S. Army, Corps of Engineers, *The Intracoastal Waterway - Gulf Section*, (Washington, DC: GPO, 1961), stresses as well the Gulf's susceptibility to sudden, violent weather and the longtime awareness of the natural protection afforded by the various inland bays. In addition, the report addresses the community dependence on coastwise commerce in the absence of other kinds of transportation.

59 *History, GIWW, p. 7.* This survey is discussed in the earlier section of the Mobile District history, which focuses on the Gulf frontier.

60 Ibid., p. 9.

61 Ibid., see also *Annual Report*, 1876, pp. 508-514; Davis, *Mobile District History, 1975*, p. 61.

62 *History, GIWW*, p. 4.

63 Ibid., pp. 4-5.

64 Ibid., p.11. Alperin cites a manuscript by U.L. Perry, prepared for the Mobile District in 1950. On file in the Public Liaison Office, Mobile District Office (Public Liaison Office is now Public Affairs Office).

65 Ibid., p. 12; see also Captain Harley B. Ferguson's preliminary examination and survey of the channel as submitted to the Secretary of War and printed in U.S. Congress, House, *Examination of Channel from Apalachicola River to St. Andrews Bay, Florida*, H. Doc. 670, 61st Cong., 2d sess., 1910, pp. 3-4, 7-8.

66 William L. Dolive, "Gulf Intracoastal Waterway," unpublished manuscript on file in Public Affairs Office, Mobile District Office, File 360 - Army Information, Gulf Intracoastal Waterway Between Apalachee Bay and the Mexican Border (Mobile District portion), 1941-1970, 1950, p. 4. Hereafter cited as File 360, GIWW, and date (the file is in two sections: 1941-1970 and 1971-1988).

67 *ARCE, 1884*, p. 1228.

68 Dolive, "Gulf Intracoastal Waterway," p. 3.

69 *History, GIWW*, p. 14.

70 Ibid., p. 15.

71 Dolive, "Gulf Intracoastal Waterway," p. 5.

72 History, GIWW, p. 15; Dolive, "Gulf Intracoastal Waterway," p. 5.

73 U.L. Perry, untitled and unpublished manuscript on GIWW on file in the Public Affairs Office, Mobile District. File 360, GIWW, 1941-1970. Information is from page 2.

74 U.S., Congress, House, Committee on Rivers and Harbors, *Letter of the Chief of Engineers, Channel Between Mobile Bay and Mississippi Sound*, H. Doc. 4, 71st Cong., 1st sess., 1929, p. 2.

75 I.L. Campbell, "The Gulf Intracoastal Waterway: Northwest Florida Section," unpublished manuscript on file in the Public Affairs Office, Mobile District Office. File 360, GIWW, 1941-1970, 1950, p. 2.

76 Harold Bell, "Inland Canal is Panhandle Trade Artery," *Panama City News-Herald*, February 14, 1960. File 360, GIWW, 1941-1970.

77 Campbell, "The Gulf Intercoastal Waterway," p. 3. Unless otherwise noted, description of the problems and the techniques for overcoming problems between West Bay and Choctawhatchee Bay is based on Campbell's narrative, which is paraphrased liberally in this history.

78 The Campbell manuscript is unclear here about depths. Later statements that the 10-foot contour was reached a second time 3 miles out into Choctawhatchee Bay infer that the work commenced at the minus-ten-foot contour. Elevations increased to a maximum of 40 feet above mean sea level (msl).

79 Ibid., p. 4.

80 Unpublished manuscript, author unknown, in File 360, GIWW, 1941-1970. The article is titled "The Gulf Intracoastal Waterway: Section Within the Mobile District, Corps of Engineers." Material cited is from page 8.

[81] Ibid., p. 9.

[82] *History,GIWW*, p. 19.

[83] U.L. Perry, untitled and unpublished manuscript on GIWW on file in the Public Affairs Office, Mobile District. File 360, GIWW, 1941-1970. Information is from page 5.

[84] Ibid.

IX. Expanding Responsibilities, 1939-1970

The period from World War II through the 1960s was characterized by increased responsibilities for the Corps of Engineers. In addition to its crowded civil projects agenda, the Corps was required to focus on environmental issues. The passage of the Flood Control Act of 1936 also involved the Engineers in the development of the nation's water resources.[1] Employment in the organization increased as projects and Federal funding proliferated. By 1970, nearly 4,000 projects were completed or were on the books, representing a Federal investment exceeding $33 billion; the Corps' civil works program employed approximately 200 military personnel and 32,000 civilians distributed across 11 Divisions, including 37 District offices.[2]

Mobile became one of the busiest District offices during the 30 years following the war. Multipurpose projects were the hallmark of the organization. One project might encompass a number of purposes including flood control (initially through reservoir construction but later through a comprehensive floodplain management), navigation improvement, hydroelectric power, municipal, industrial, or agricultural water supply, water quality control, recreation, or wildlife conservation and management. The civil works mission of the Corps had evolved considerably from one "of mud-pumping."

The Corps' expanded responsibilities came about through a long and complex process. Disastrous floods in the early twentieth century provided a major impetus for national reassessment of water resources development and management. Flood control was initially the responsibility of the individual states but became a national priority following the Mississippi River flood of 1927, commonly referred to as the "great flood." Concern over the environmental and economic devastation caused by the flood led Congress to establish the Mississippi River Commission. At the same time, congressional legislation authorized the Secretary of War to construct dams across navigable rivers.[3]

At the turn of the century, the Corps found its regulatory authority expanding through additions to the annual rivers and harbors legislation. However, the organization did not seek to exercise its broad powers and instead acted largely in an advisory capacity to Congress. The Corps neither proposed navigation programs nor took an active role in the nationwide, comprehensive planning proposed by the executive branch during the first two decades of the twentieth century.[4]

The Mobile District became heavily involved in flood control construction from the 1920s to the early 1930s as legislation expanded the planning functions of the government's construction agencies, of which the Corps was the chief agency. Among the results of this legislation were the "308 reports", which called for navigation improvement plans encompassing flood control, power, and irrigation. A series of reports covered reservoir construction on tributaries of the Mississippi River and the effect they might have on flood control. The general conclusion was that reservoirs were the most logical and expedient way to control floodwaters.[5] Although one of its chief responsibilities until after the Vietnam War, reservoir construction in later years subjected the Corps to controversy and criticism of its management of the nation's water resources.

In the New Deal era, water resources projects were considered a mechanism for stimulating construction and thus providing critically needed jobs. New Deal planners were concerned that all projects be related to and coordinated with comprehensive plans for development of an entire river basin. A concerted effort was made to avoid pork barrel projects, particularly those where lack of coordination resulted in poorly planned and poorly built structures.[6]

The Flood Control Act of 1936 set into motion a national flood protection plan and gave the Corps jurisdiction over Federal flood control protection investigations and river improvements. In addition, a number of reservoir projects were approved for preliminary investigation and surveying. With its expanded responsibility as an outgrowth of the 308 reports, the Corps was well on its way to taking the lead in nationwide, comprehensive river basin planning with an emphasis on navigation improvement and flood control.[7]

The congressional drive to expand the Corps' regulatory authority was not without opposition. As stated earlier, during the early decades of the twentieth century, Congress and the executive branch struggled to determine which branch would control the water resources programs. To complicate matters, the four main construction agencies (the Corps of Engineers, the Bureau of Reclamation, the Tennessee Valley Authority, and the Soil Conservation Service) had overlapping and conflicting responsibilities.

Congress increasingly assumed authority for oversight of the programs, and its preferred construction agency was the Corps of Engineers. Between 1943 and 1960 Congress solidified its control of agency programs.

The Corps had the greatest geographical advantage of the construction agencies because it already had broad regulatory powers over the nation's waterways. The Corps continued to develop its lead as the main construction agency in the water resources field, and the Flood Control Act of 1944 established the Corps' governing policy for flood control. As flood control gradually became the focus of Engineer activity, navigation improvement was relegated to a secondary position (where it has remained to the present day).[8] The act also established a nationwide policy for hydropower, and it made channel and major drainage improvements part of the Corps' responsibility for maintaining flood control. In addition, the act established the Corps' authority for developing recreation potential in connection with its reservoir projects, a function that has been of major significance in the Mobile District.[9] Erosion control along the nation's shorelines was mandated by Congress in 1946 and the 1958 Flood Control Act further expanded the Corps' regulatory responsibilities by broadening the scope of water resources management.[10]

As its regulatory responsibilities were increasing, Corps construction projects continued in river basins across the United States. Congressional confidence notwithstanding, in the postwar era the Corps increasingly became the focus of public attacks from environmentalists. The same projects intended to protect against the environmental and economic repercussions of flooding were blamed for increased environmental destruction and deprivation.[11] The Corps of Engineers was roundly criticized for failing to adopt a broader approach to the problem of flood control. The criticism eventually led to a major shift in the Corps' approach to developing water resources, one based on comprehensive river basin planning and floodplain management. Rather than functioning as a laissez-faire regulator, the Corps became an active and critical overseer of the nation's environmental resources.

Additional legislation refined, and in some instances redefined, the Corps' mission. From the mid-1930s through the mid-1960s, the approach to flood control was largely through engineering techniques, specifically reservoir construction.[12] By the late 1960s, many people were skeptical about reservoir construction as the solution to flood control and floodplain management. Passage of the National Environmental Policy Act (NEPA) in 1970 resulted in additional changes; others came about through reduced funding because of the Vietnam War.[13]

Civil Works, 1939-1953

World War II materiel demands effectively shut down civil works projects in the Mobile District. Projects that continued involved improvements that would complement wartime demands, principally the shipment of war materials like petroleum. Limited dredging was done in major river channels to keep shipping lanes open. A major project for the District was improvement to its portion of the Intracoastal Waterway, which was enlarged to accommodate increased movement of petroleum supplies from the Texas-Louisiana fields eastward toward the Atlantic. The presence of enemy ships in the Gulf of Mexico made the GIWW an important military supply line.

The numerous flood control projects already authorized by Congress were suspended temporarily. Within the District, only two were recommended for funding by 1940: the Autauga Creek project and Allatoona Dam. Improvement to Autauga Creek would provide flood protection for Prattville, Alabama, which had been damaged in several previous floods. Allatoona Dam, the more important of the two projects, was intended primarily to halt flood damage to Rome, Georgia, and surrounding land and to supply electricity at a time when demand was inordinately high.[14]

Plans for construction of the Allatoona project were carried over into 1941. The dam was to be located about four miles east of Cartersville on the Etowah River. It was to be a concrete gravity dam 165 feet high, fitted with four lift gates each 30 feet wide and 25 feet high (Figure 9-1), and would have a discharge capacity under a 25-foot head of 56,000 second-feet. The dam would create a reservoir covering 18,500 acres with a gross capacity of 630,000 acre-feet. The project also included a power plant designed for contemporary demands but capable of future expansion. Total cost of the project was estimated at $13 million, but in 1941 Congress appropriated just $3 million for its initiation.[15]

The Flood Control Act of 1944 provided for the project's expansion. Increased dam height (from 165 to 190 feet) meant the reservoir would cover 20,300 acres and contain 722,000 acre-feet. Cost of the project increased to $17,400,000. Work during the war included completion of plans, design of the turbines, and land acquisition. Construction on the dam was not started in 1945.[16]

The end of World War II brought abrupt changes to the Mobile District, as had its beginning. Mobilization had meant a total shift to meet the demands for military construction. Only such civil works as contributed to the war effort were continued; "compared to the urgent military work the District wartime civil role was of minor significance."[17] Following the war, national attention shifted to dismantling much of the military construction and a resumption of civil works projects. The District rapidly returned to prewar business. The Allatoona project, and one for the Pearl River locks, were updated swiftly in an effort to facilitate construction awards.[18] Other significant multipurpose projects soon followed, including the Jim Woodruff Lock and Dam, the Buford Dam, and the Walter F. George Lock and Dam on the Apalachicola-Chattahoochee-Flint River system (Map 9-1).[19]

Allatoona Reservoir epitomized the speed with which a large multipurpose project could be completed. Contracts were awarded by the end of the Fiscal Year 1946. During 1947 construction was under way on the dam, the roads, reservoir clearing, and numerous other jobs. By the end of Fiscal Year 1948 the project was nearly 50 percent complete.[20]

However, the cost of the project escalated significantly. Aside from the increased dam height, acquisition of new land for the reservoir, relocation of roads, removing and rebuilding of railroad bridges, and utilities relocation all contributed to the escalating costs.

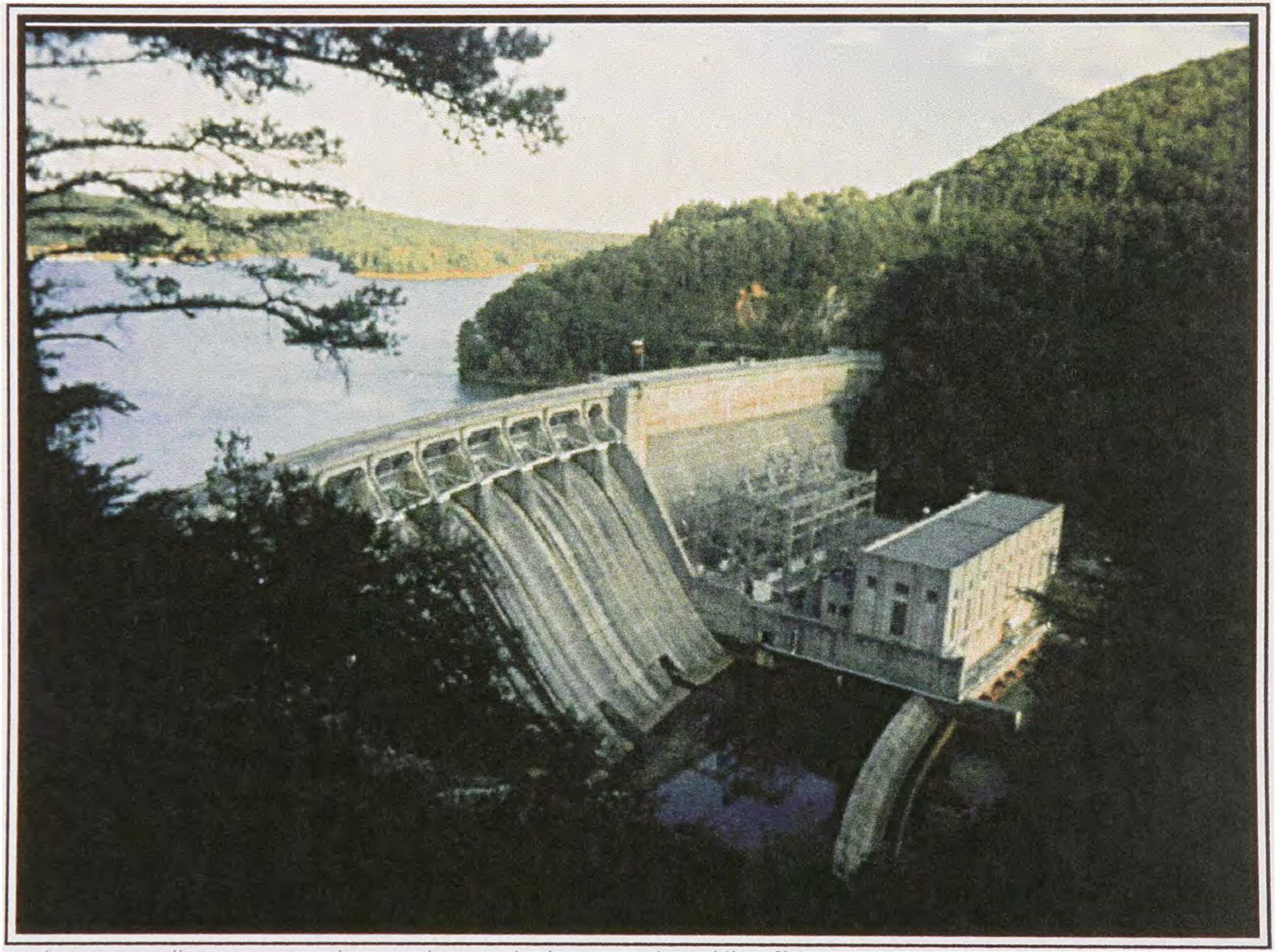
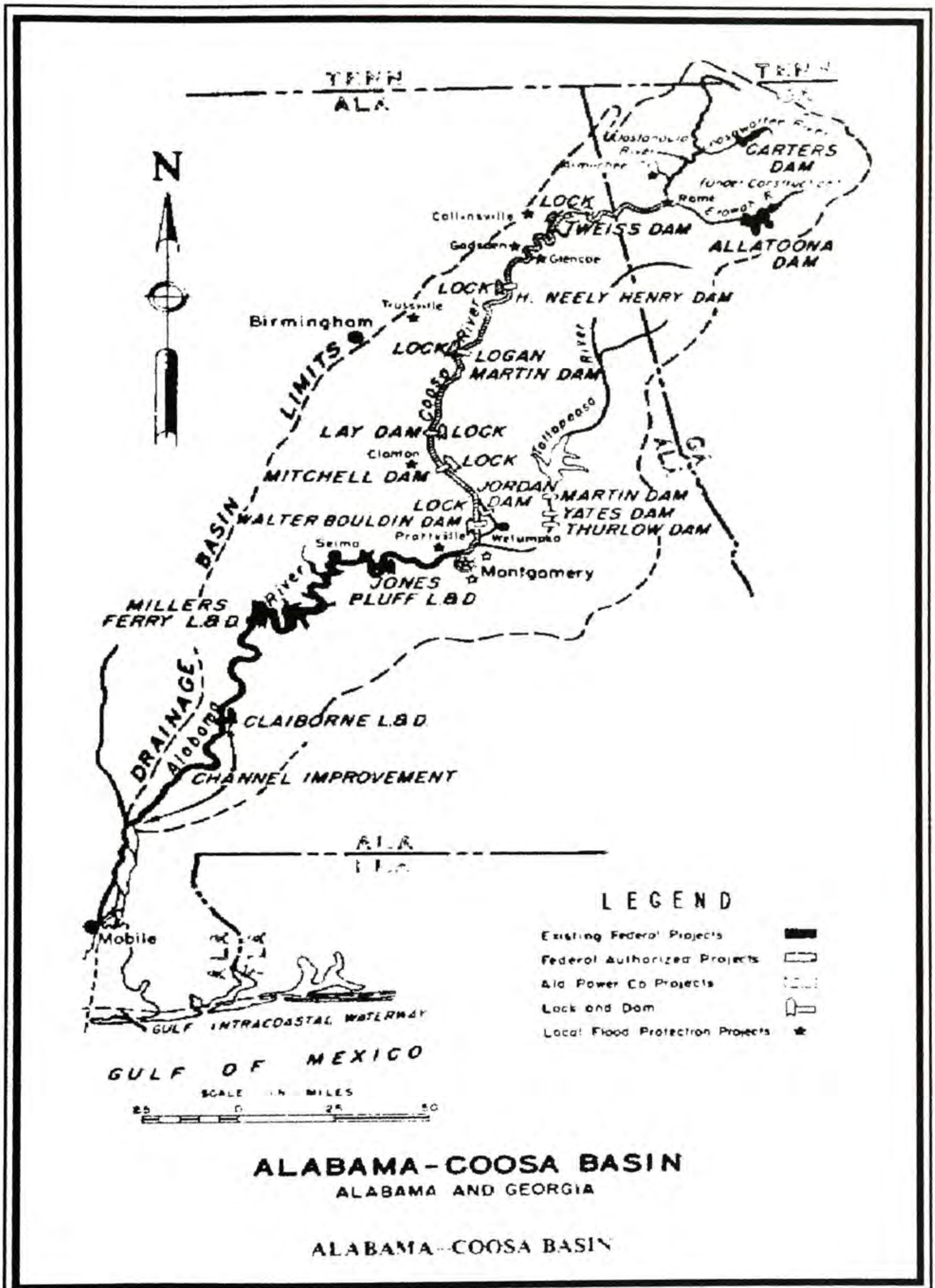


Figure 9-1. Allatoona Dam and Reservoir, Etowah River, Georgia (Public Affairs, MDO).



Map 9-1. Civil works projects in the Mobile District, 1985 (MDO).

By 1948, the projected cost was $31,922,000; the final cost was slightly over $35 million. By 1951, the project was 99 percent complete.[21] Heavy rains in the headwater area during the winter of 1954 caused an 18-foot rise in the reservoir level. Natural flood stages were lowered at Rome, Georgia, and Gadsden, Alabama, by 4 feet and 2 feet, respectively, and savings from flood losses were estimated in excess of $400,000.[22] The Allatoona Dam had passed its first test and affirmed the logic of a comprehensive river basin approach to control flooding.

Routine navigation maintenance, mostly dredging, continued between the end of World War II and the Korean War. However, no major new work was initiated on rivers and harbors. Modernization of the Black Warrior-Tombigbee system continued with the construction of new locks. The project had commenced in 1887 and was about 70 percent complete in 1949. By this time 18 locks and dams were constructed, although some had deteriorated over time and changes in navigation needs meant the old locks were too small. A new project would replace several of the older locks.[23] In addition to the work on the Black Warrior River, plans were unfolding for the Tennessee-Tombigbee Waterway, connecting the Tennessee Valley with the Gulf of Mexico. The slackwater navigation improvement plans for the Tombigbee above Demopolis were abandoned in 1935, but in 1946 Congress authorized the construction of the Tombigbee Waterway.[24] By the end of Fiscal Year 1953, preliminary plans for the Tombigbee Waterway project were under way; some soil sampling had been accomplished as well.[25]

The Rivers and Harbors Act of 1945, which approved a general plan for the complete development of the ACF system, initiated an ambitious, comprehensive basin plan. Except for the Columbia Lock and Dam, which was built for navigation improvement, the other three projects were multipurpose and called for major hydroelectric capacity.[26] The combined kilowatt output would be approximately 267,000 annually and the estimated cost for the projects would exceed $186 million.[27]

The Mobile District's project agenda, which included updated designs, called for a larger and more versatile organization. Almost all of the work was done in house; private engineering companies were used only to design the hydroelectric plants and certain bridges or other structures in the reservoir areas. In addition, the District adopted new technologies associated with hydraulic structures, the control of concrete mixes and placement of masses of concrete, and various other machinery and power-generating equipment.[28]

The early 1950s were a time of renewed military activity with a corresponding reduction in civil construction. The Korean War required the revitalization of World War II military structures that had been in continuous use, as well as the construction of many new facilities. Once again, Mobile District personnel were shifted to military construction. Military construction expertise gained during World War II proved valuable to the District. As a result, it was much better prepared for rapid mobilization when the Korean conflict began.

Civil Works, 1954-1970

Much of the construction program following the Korean War was in conjunction with the nation's expanding missile and space programs. Substantial work was still on the books, however, for navigation improvement and the various multipurpose projects authorized after World War II. Although authorized in the mid-1940s, many of the projects were not actually initiated until funds were appropriated in the 1960s.

One peak of District activity occurred in the mid-1960s; in 1964 about $250 million was spent on military projects (primarily associated with the missile projects) and over $300 million on civil projects.[29] This represented the largest expenditures in the District since the peak years of military construction during World War II, and the Mobile District was the busiest of the 42 Corps Districts throughout the world.[30] At one time during the 1960s, the District administered over 200 active contracts for various projects.

Mobile Harbor

Except for the Civil War period, improvement to Mobile Harbor continued uninterrupted from 1826 until a final phase of improvement was initiated in 1963. One improvement was authorized in 1931 and completed in 1949. In 1954 a modification was authorized to achieve a bar channel depth of 38 feet and a river channel depth of 36 feet; this modification was completed in 1957. This extensive 1963 project was intended to guarantee Mobile's place as one of the nation's premier harbors.[31] Despite such expectations, Mobile never seriously rivaled New Orleans.

The final phase of the project called for changes in the width and depth of the segments of the main navigation channels that provided access to the harbor. In addition, several large turning basins were scheduled for construction, including one opposite the Alabama State Docks, Magazine Point, and at Brookley Air Force Base's ocean terminal.[31] Work on this comprehensive project was initiated 1 July 1963 and by the close of Fiscal Year 1964 the pipeline dredges *Duplex*, *Diesel*, and *McWilliams* had removed more than 13 million cubic yards of material.[33] The project was completed in July 1965.

Alabama-Coosa Rivers, Alabama and Georgia

The Rivers and Harbors Act of 1945 also authorized navigation projects on the Alabama and Coosa Rivers (Map 9-2). Authorization provided for the development of these rivers and their tributaries for navigation, flood control, power, and other purposes according to plans developed by the Chief of Engineers at a cost not to exceed $60 million.[34]

Modifications were allowed from time to time at the discretion of the Secretary of War and the Chief of Engineers for increasing the development of hydroelectric power. Project costs for both rivers, including modifications, were not to exceed $60 million in congressional appropriations. The initial phase of the project was for construction of the Howell Mills Shoals, Jones Bluff, and Millers Ferry multipurpose improvements, and the Claiborne Lock and Dam navigation improvements.

Spiraling construction costs pushed the estimated project total to more than $198 million in 1954, and Congress modified the comprehensive plan by suspending authorization of the Coosa River project. The Coosa was to be developed by nonFederal interests through construction of a series of dams under license pursuant to the Federal Power Act.[35] Site selection for Jones Bluff and Millers Ferry began in 1956. By 1963 another multipurpose project, Carters Dam on the Coosawattee River in northwest Georgia, was added. In 1963, construction began at Millers Ferry, while planning studies continued on Claiborne Lock and Dam and were initiated for Jones Bluff.[36] Construction began at Claiborne Lock and Dam in 1965 and at Jones Bluff in 1966. By this time, Carters Dam was 23 percent complete, Claiborne was 9 percent complete, Millers Ferry was 42 percent complete, and Jones Bluff was 2 percent complete.[37] Except for Millers Ferry, which was put into temporary operation in 1968, none of the multipurpose projects were scheduled for completion until after 1970.[38]

Map 9-2. Index map, Alabama - Coosa River Basin (*Water Resources Development in Alabama 1987*, MDO).

Tennessee-Tombigbee Waterway

Interest in the Tombigbee River's improvement began shortly after the Civil War. Repeated surveys of the river, however, failed to justify improvement because commercial traffic was negligible. Only portions of the river were improved above Demopolis, although improvements were made downstream from the city during the 1950s (Figure 9-2).

However, in 1935 Congress abandoned the slackwater improvement of the Tombigbee and no authorizations were forthcoming until the Rivers and Harbors Act of 1946 funded the connection of the Tennessee and Tombigbee Rivers. The connection would be accomplished via the East Fork of the Tombigbee River and Mackeys and Yellow Creeks, and would provide a channel from the junction of the Tombigbee and Black Warrior Rivers at Demopolis, Alabama, to Pickwick Pool on the Tennessee River, some 260 miles to the north. The channel would be 9 feet deep, would have a minimum bottom width in the river and canal section of 170 feet, a minimum bottom width in the divide cut of 150 feet, and would have locks with clear inside dimensions of 110 by 600 feet (Map 9-3).[39]

The plan of improvement called for the waterway to be divided into three sections:

- A river section from the junction of the Warrior and Tombigbee rivers at Demopolis to mile 180 on the Tombigbee
- A canal section from mile 180 to mile 221
- A divide section from mile 221 to mile 260 at the Pickwick Pool on the Tennessee River

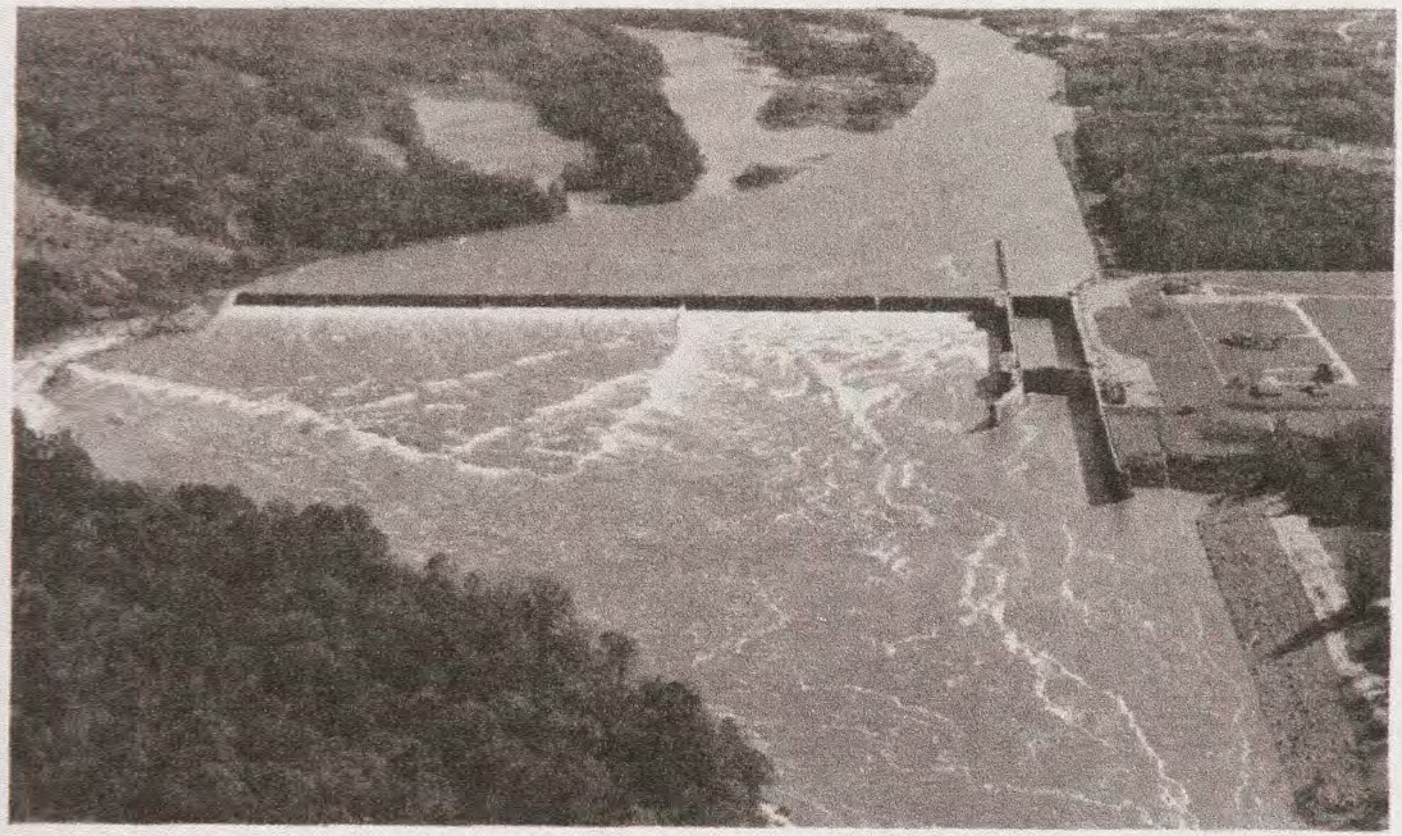
There would be four locks on the river section, six on the canal section, and one on the divide. The construction plan called for improvement to the Tombigbee River as far north as Amory, Mississippi. Above this point, a canal would be constructed with a series of locks. The connection with the Tennessee River called for a cut through the natural divide separating the watersheds of the Tombigbee and Tennessee Rivers. The estimated cost in 1953 was $217,724,000.[40]

By 1970, no construction had been initiated on the waterway, but the widths and depths of the channels had been altered in the three sections, and the estimated cost had been revised upward to $345,170,000.[41] The construction of the Tennessee-Tombigbee Waterway had a major national impact on the environmental movement in the United States in the 1970s and 1980s.[42]

Apalachicola-Chattahoochee-Flint System

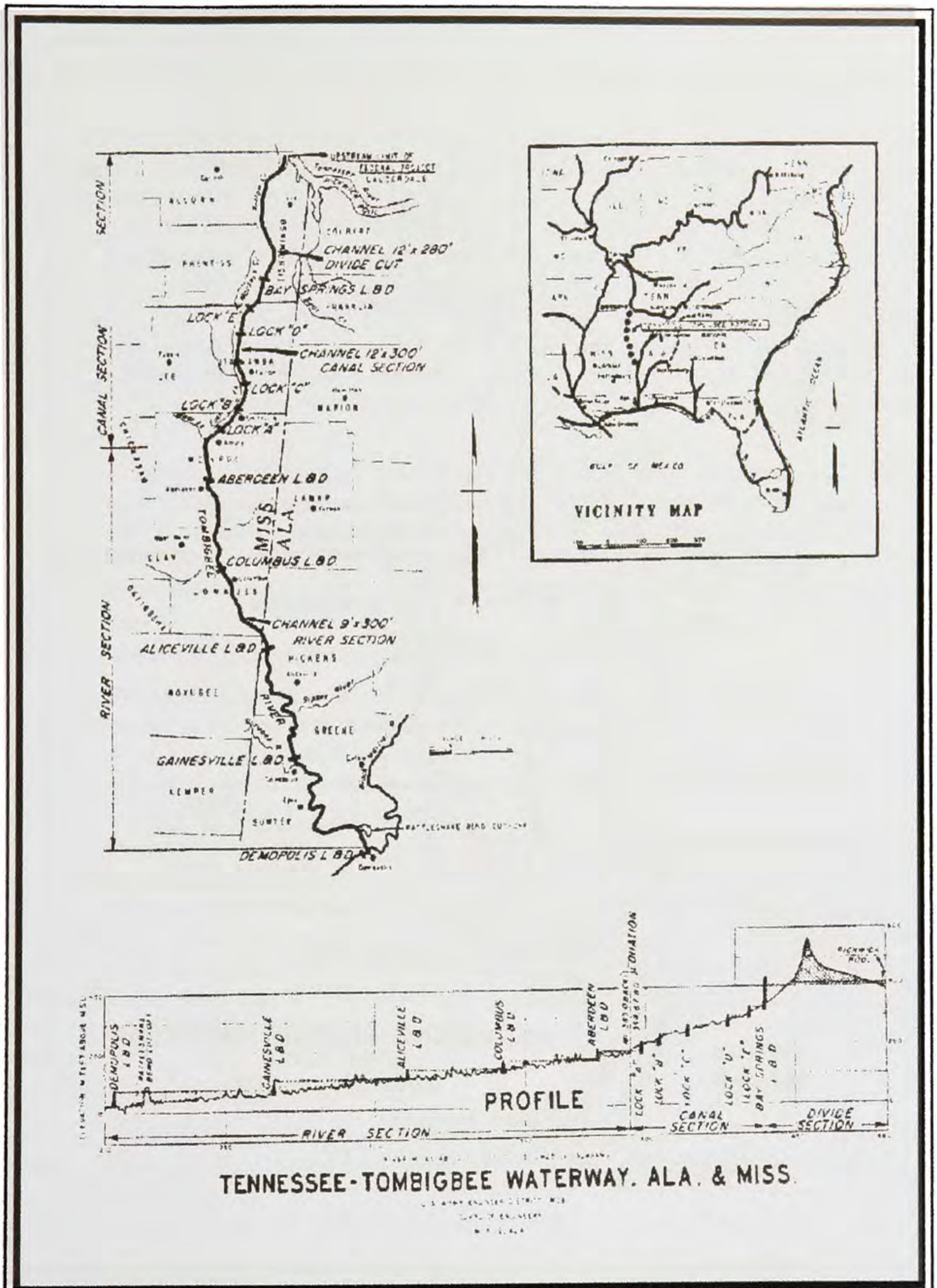
Within the eastern portion of the Mobile District, the major focus of activity centered on the improvement of the Apalachicola-Chattahoochee-Flint River system (Map 9-4). The basin-wide project consisted of the Jim Woodruff Lock and Dam (Lake Seminole), the Columbia Lock and Dam (George W. Andrews Lock and Dam), the Fort Gaines Lock and Dam (Walter F. George Lock and Dam), and the Buford Dam (Lake Sidney Lanier). Construction of Buford Dam was initiated in 1950 and was about 21 percent complete in 1954.[43] The Jim Woodruff Dam project had been under way since 1947 and was more than 70 percent complete in 1954. All that remained to be done was completion of the gated spillway, powerhouse, and switchyard. No work had started on the Columbia Lock and Dam or the Fort Gaines project in the early 1950s.

By the late 1950s, all major construction on the Buford Dam and Reservoir was completed. The reservoir was put into use for flood control in February 1956, and the power units were all placed on line in 1957. Construction on the Fort Gaines project, renamed

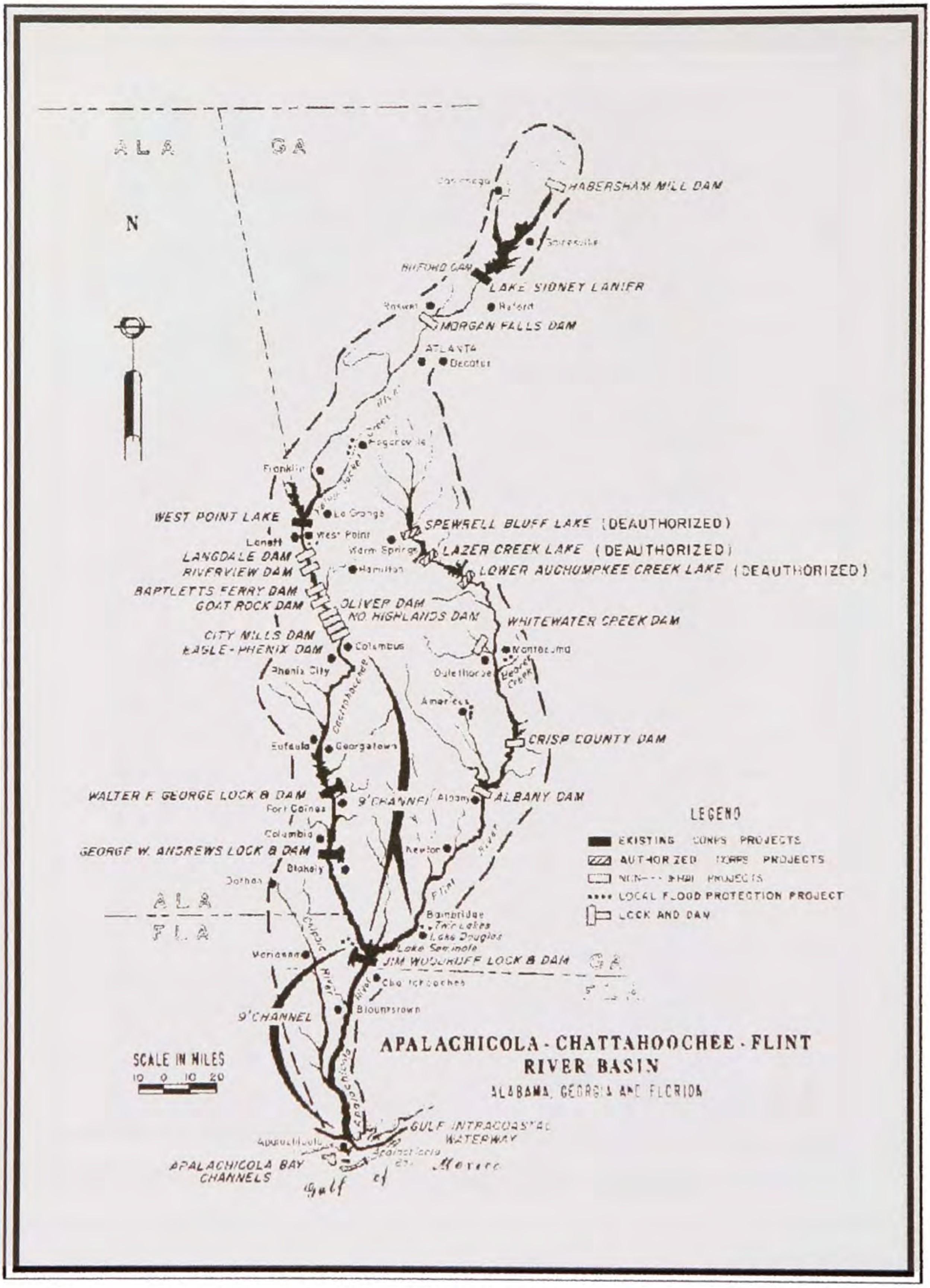


Demopolis Lock and Dam - Tombigbee River at Demopolis

Figure 9-2. Demopolis Lock and Dam, Tombigbee River, Alabama (Public Affairs, MDO).



Map 9-3. Index map, Tennessee Tombigbee Waterway (*Water Resources Development in Alabama 1987*, MDO).



Map 9-4. Index map. Apalachicola-Chattahoochee-Flint River Basin (*Water Resources Development in Alabama 1987*, MDO).

the Walter F. George Lock and Dam, was started in October 1955. The Jim Woodruff Lock and dam was essentially completed by the mid-1950s. The lock was opened in 1954, the pool was up to project level by 1957, and all power-generating units were placed on line in 1957.[44]

Periodically, new projects or additions to existing work expanded the scope of basin development. Additions came about because of continued monitoring of streams in the basin and predictions about flooding. The public also put pressure on the Corps for additional protection. In 1962, for example, West Point Dam was authorized by a flood control act. By 1964, Jim Woodruff Lock and Dam was complete, Walter F. George Lock and Dam and Buford Dam were 99 percent complete, Columbia Lock and Dam was nearly 96 percent complete, and the West Point Dam project was under way. At the West Point site, reservoir mapping was complete and design work on the hydropower capacity, the hydrology and hydraulic analysis, site selection, and geology were complete. Foundation investigations at the dam site were completed and the general design studies were approximately 35 percent complete.[45]

P. L. 88-253 of 30 December 1964 authorized the construction of Sprewrell Bluff reservoir on the Flint River, although construction was not initiated at that time.[46] Other projects added to the Flint River development were the Lazer Creek Dam and Reservoir and Lower Auchumpkee Creek Dam and Reservoir; construction was not initiated prior to 1970.[47] Total funds appropriated by 1970 for the various projects on the ACF system approached $227 million.[48]

Responsibilities Complementing Civil Works

Although the District's staff focused most if its energy on the design and construction of the numerous navigation and multipurpose projects, it had other responsibilities. Some of these related to the new focus on comprehensive river basin development. For example the development of recreation facilities, authorized by Congress in 1944, became an active part of the numerous multipurpose projects.

Growing environmental awareness, particularly during the 1960s, resulted in added responsibility for shore protection against beach erosion. The ongoing problem of controlling aquatic plants continued. In addition, the Mobile District periodically undertook studies on a wide variety of topics relevant to flood control, conservation, and other environmental topics. The data were made available to local, regional, and state planning agencies, municipal authorities, and other researchers who, in turn, used the information to predict potential flood hazard zones and to formulate land-use plans for floodplains, and for various other purposes.

Aquatic Plant Control

The Mobile District has been involved in aquatic plant control since the turn of the century. The original authorization dates to 1899 and since then regular, but limited, funds have been made available. The project was intended to eliminate plants obstructing commerce from the navigable waters of the Gulf coast from Florida to Texas. The Corps of Engineers was empowered to accomplish the project by mechanical, chemical, or any other means. By the mid-1950s nearly $450,000 had been expended toward plant control.[49]

In 1958, Congress expanded the program. The control area was increased to include the states of Georgia, North Carolina, and South Carolina.[50] The Mobile District, however, was responsible only for navigable waters, tributary streams, connecting channels, and other allied waters within its territorial limits. In addition to the increased territorial limits, the species of plants subject to eradication (the major offender being the water hyacinth) was expanded as well. The enhanced efforts were in response to a combined interest in navigation, flood control, drainage, agriculture, fish and wildlife conservation, public health, and other related purposes. Research and development was to continue in an effort to discern the most efficient and effective methods of control.[51] Treatment began in the Florida and Louisiana portions of the District in 1960, although preparation for the project began in 1958 and the research program was initiated in 1959.[52] With periodic authorizations, plant control has remained a continuing task for certain navigable channels in the District.

Shore Protection (Beach Erosion)

The District's work in retarding beach erosion is a constant battle against nature. The long, exposed coastline is subject to a variety of current and wave action, as well as destruction from periodic storms and seasonal hurricanes in the Gulf area. Serious erosion problems were apparent during construction of the seacoast fortification system; Fort McRee, on Santa Rosa Sound, was eventually destroyed by shore erosion. In order to combat the erosive action of tides, currents, and waves, Engineers constructed jetties, breakwaters, and seawalls in numerous harbors and at exposed locations along the Gulf coast.

Federal assistance in shore protection and beach erosion control came from P. L. 71-520 (3 July 1930), which established the Beach Erosion Board.[53] The board, working under the supervision of the Chief of Engineers, was responsible for supervising cooperative studies for shore protection and beach erosion control. The board determined the most effective methods for improvement, restoration, and protection of beaches. From 1930 onward, reports covering improvement of river mouths were required to contain information on the potential impacts of suggested improvements on adjacent shorelines. Not until 1946 was legislation passed that authorized Federal participation in the cost of protecting shorelines.[54]

By the late 1940s, local governments nationwide were seeking Federal assistance (as provided in the 1946 legislation) for recreational beach development. One such shore-protection project initiated after World War II, and the only official shore protection project for the Mobile District listed in the *Annual Reports* between 1953 and 1970, was the Harrison County, Mississippi, project for repair of the county's seawall and construction of a 24-mile-long beach from Biloxi lighthouse to Pass Christian.[55] The completed project would provide a beach with an overall width of 300 feet above mean sea level. The Rivers and Harbors Act of 1948 required local interests to supply 66 percent of the estimated cost (cost sharing was specified in P.L. 79-727 of 13 August 1946); the government cost was limited to $1,133,000.

Local authorities had to develop a set of plans for repair and maintenance of the facility; submit their plans for repair of the seawall and development of the beach to the Chief of Engineers for approval before any work commenced; and provide all land, easements, and rights-of-way for accomplishing the project. Other local responsibilities included promising to maintain the seawall, drainage facilities, and the beach by artificial replenishment.

The seawall was to be repaired using the pressure-concrete method. Over 50,000 linear feet of seawall were repaired by this method in 1950. The project commenced in January 1950 and was about 5 percent complete by the end of the fiscal year; 55 percent of the seawall repair was finished.[56] Assurances of local support were approved by the Chief of Engineers in January 1951 and a contract was executed between the Mobile District Engineer and the Harrison County Board of Supervisors later that month.[57] Repairs to the seawall were completed in 1951 and drainage and beach improvements were well under way. The project was completed in June 1952 with repairs to the seawall, drainage alterations, and construction of the protective beach.[58]

Recreation

Recreational development became a part of the Corps' overall responsibility as a result of legislation passed in 1944.[59] However, the incorporation of recreation development in water resources projects did not become widespread until the various comprehensive river basin plans began to evolve in the 1960s. The reluctance to include recreation features in projects can be attributed partly to the Federal government not wanting to recognize recreation as a project benefit that could be used to justify reservoir/lake construction.[60] In addition, funds for recreational facilities had to be approved by the Bureau of the Budget, which consistently challenged the idea of Federal involvement.[61] The Corps lacked properly trained staff to address recreation and depended largely on National Park Service personnel or private consultants. Furthermore, the land-acquisition policy used by the Corps' real estate personnel up to that time focused on acquiring land for traditional project purposes. All in all, recreation seldom received adequate consideration because of the Corps narrow perspective.[62]

By the early 1960s, the Federal government began to form a new attitude concerning recreation development. The creation by Congress in 1960 of the Outdoor Recreation Resources Review Commission (ORRRC) led to an investigation of the role of recreation in present and future American life. The ORRRC's final report established that the public considered recreation to be a vital part of the quality of life. Additional organizations were created to investigate the need for public access to water resources, and the Corps was authorized through the Flood Control Act of 1962 to construct, operate, and maintain recreational facilities at its water resources projects.[63] The Federal Water Project Recreation Act of 1965 codified the policy changes that had been evolving as a result of the ORRRC's investigatory work. Recreation could then be considered a benefit on a par with navigation and flood control. The same act stipulated the sharing of financial responsibility among Federal, state, and local governments for developing and maintaining recreational facilities.

The numerous river and harbor improvements already completed or in progress, while mainly developed for nonrecreational reasons, provided substantial public recreation opportunities. Among the outdoor activities associated with the various waterways and harbors were boating, fishing, swimming, camping, hunting, picnicking, and sightseeing. In addition, Corps projects provided water and land for conservation and management of fish and wildlife resources.

The Gulf Intracoastal Waterway is one of the District's major recreational developments, though it was created to provide a safe inland waterway for small craft along the Atlantic and Gulf coasts. It has become a major thoroughfare for pleasure boaters and fishermen from all over the eastern United States. The vast network of improved tributary river channels has created hundreds of miles of navigable streams ideally suited for pleasure craft and fisherman. The GIWW is one of the most extensive recreational projects in the United States and it continues to be a major factor in the region's tourist trade.[64] In addition to safe waters and good fishing, the GIWW attracts large numbers of people who are drawn to the region's mild climate, its scenic and historic attractions, the numerous entrances to the Gulf of Mexico, the good accommodations, and the wide variety of sponsored regattas and water events.[1] The strongest focus of recreational development within the Mobile District is on the various reservoir/lake projects and their attraction to the general public (Figure 9-3); recreation is a spin-off of these large multipurpose projects. Major recreation attractions include water sports such as sailboating, motorboating, waterskiing, swimming, and fishing. Hunting, camping, hiking, and other related activities also are popular.

The Corps was responsible for providing public access to water resources, along with access roads and parking areas. Boat ramps and public toilets were also typical of the amenities provided by the Federal government. Additional services, such as boat rentals, restaurants, and long-term and overnight accommodations, were leased to concessionaires.

By the late 1960s, large sums of money were expended on the development of facilities to handle the anticipated public use of reservoir/lakes. In 1968, over $4.2 million was spent in the Mobile District for recreation development; by 1970, the cost of added facilities approached $6.5 million for the ACF system alone.[66] Most of this money was spent at Lake Sidney Lanier and Lake Seminole, and on the project located on the Black Warrior and Tombigbee rivers. Funding for Lake Sidney Lanier was facilitated by the fact that the lake is within easy driving distance of Atlanta, and its heavy use was realized soon after it opened. The lake had 10,954,000 recreational user days recorded in 1969.[67] Other reservoirs and projects in the ACF system were used heavily as well. George W. Andrews Lock and Dam totaled 186,500 user days, Lake Seminole had 2,110,300, and Walter F. George Lock and Dam logged 2,871,600 recreational user days.[68] Recreational user days for all reservoirs within the Mobile District have increased steadily since the reservoir/lakes opened.

The Corps obviously will continue to play a vital role as population increases in the District and more demands are placed on the area's recreation facilities. The Corps' role in the operation and maintenance of recreational facilities associated with its water resources projects was assessed in the mid-1960s and predictions made concerning future workloads.[69] The assessment results indicated continued geometric growth in water resources activities. Recreational demands were expected to triple between 1966 and 1980.[70]

Disaster Assistance

Another important Mobile District responsibility that expanded in the postwar period was to provide assistance in times of natural disasters. The Corps' role in disaster assistance originated in the nineteenth century. For example, the Corps provided hurricane relief efforts at the time of the Galveston storm of 1875.[71] The Johnstown flood of 1889 marked the Corps' first official role in disaster relief work.[72] The government's initiation as a direct participant in flood control came with the Corps' responsibility for navigation on the Mississippi River, which result in the organization of the Mississippi River Commission in 1879.[73] Numerous calamities calling for assistance beyond the capability of the local communities forged a new role for the Federal government in disaster assistance, and the Corps was the logical agency to assume the task of coordination. Other disaster relief efforts that the Corps coordinated related to the control of mining debris in California that interfered with navigation on the Sacramento and San Joaquin Rivers (1893); numerous floods on the Mississippi (particularly the floods of 1897 and 1927); the Galveston hurricane of 1915; the Texas City explosion of 1947; the devastating Alaska earthquake of 1964; and damage from Hurricane Agnes in 1972.[74]

Legislation gradually increased the Corps' level of responsibility for disaster assistance, particularly the Flood Control Act of 1917 that called for examinations and surveys of all navigable streams in the country and that placed Federal interest in flood control under the auspices of the Corps. The 308 reports that were generated by the passage of

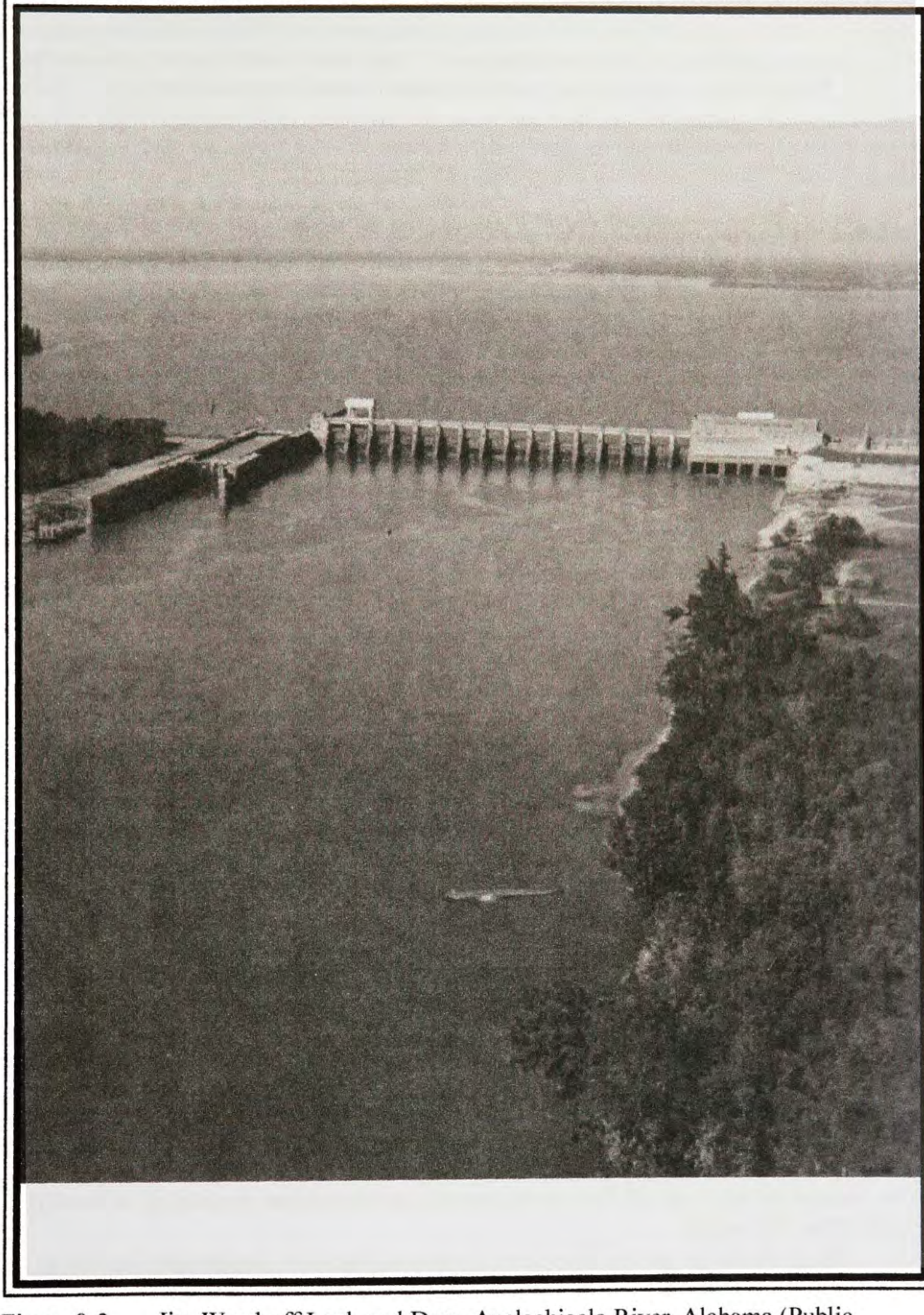


Figure 9-3. Jim Woodruff Lock and Dam, Apalachicola River, Alabama (Public Affairs, MDO).

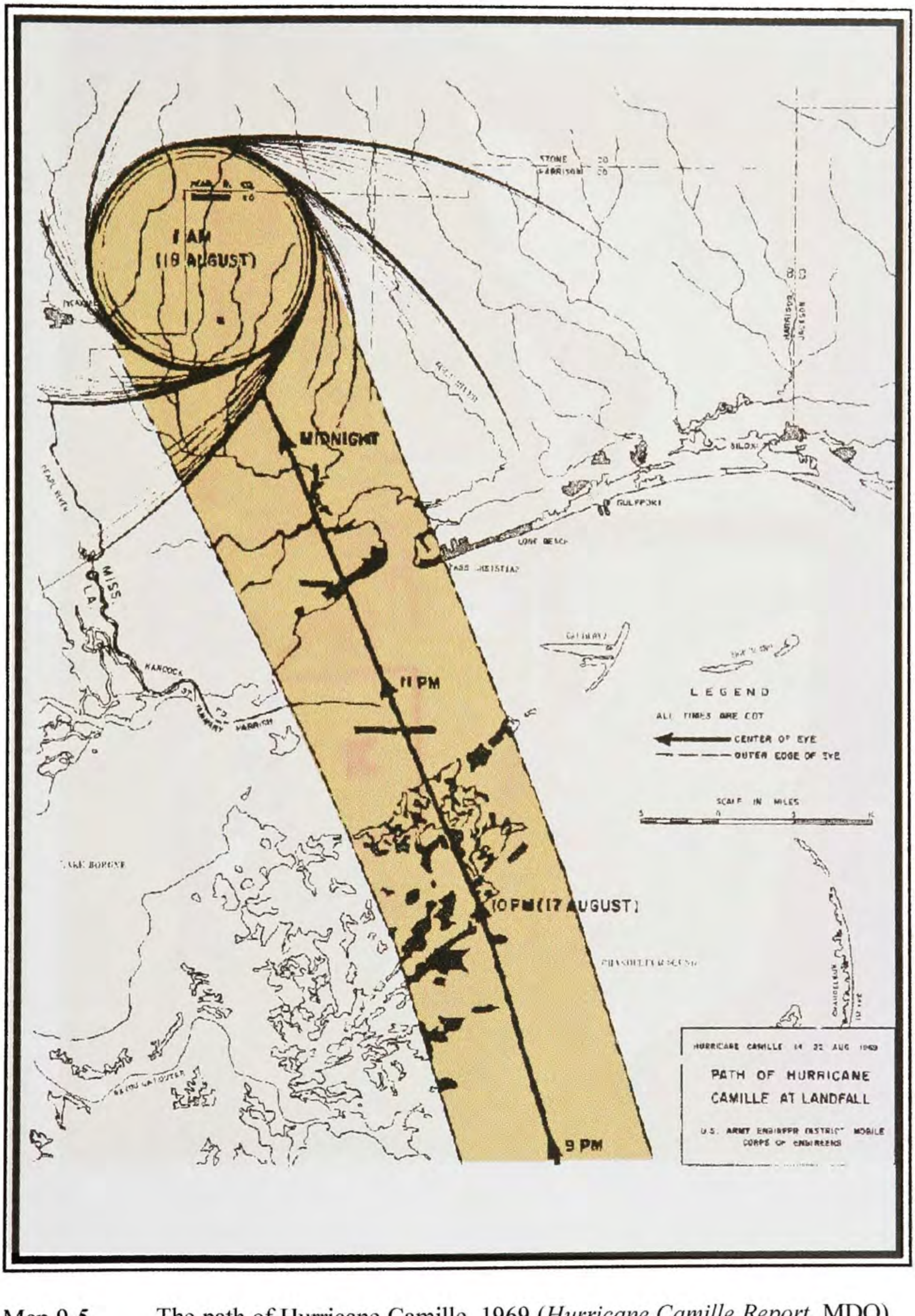
House Document No. 308 in 1927 expanded the 1917 Flood Control Act by calling for surveys of all navigable streams of the nation for the purpose of "navigation, development of water power, control of floods, and irrigation."[75] The Flood Control Act of 1936 escalated Corps responsibilities by recognizing that flood control was a proper activity for the Federal government in cooperation with state and local governments. This legislation led to Corps construction of 300 to 400 reservoirs around the nation to curtail flood disasters.[76] Additional statutory authority for prevention and control of floods, and related disaster assistance, came from the Flood Control Act of 1941, as amended in the acts of 1946 and 1948, and in Section 250 of the Flood Control Act of 1950 and its amendments.[77]

Additional authority for the Federal government to assist state and local governments in alleviating suffering and damage from natural disasters was established by P. L. 81-875 (30 September 1950).[78] The Office of Emergency Planning (OEP) was set up [OEP was replaced in 1978 by the Federal Emergency Management Agency (FEMA)] to administer assistance when requested. Whenever the President concurred with a state governor's request for help, a declaration specifying a natural disaster area would be issued and OEP would go into action.[79] Following a decision as to what types of aid the Federal government would render, the Corps was called on to assist OEP because it could tap an operational network with broad geographic advantages. Coupled with its access to military manpower, supplies, and equipment, the Corps was in a better position to respond quickly during emergency situations than any other Federal agency. The authority provided in P. L. 81-875, the emergency authority of the Secretary of the Army, and the regular authorization and appropriation processes gave the Corps' vast and flexible capabilities to deal with natural disasters.[80]

Mobile is certainly not the only District called upon to assist in emergency relief. Perhaps the greatest national disaster of the 1960s was the Alaskan earthquake. Corps personnel in the Pacific Northwest and elsewhere responded to the call for help. Disasters in Hawaii, the western United States, the Ohio basin, and the Florida peninsula have all been the scene of significant Corps activity and assistance. The Gulf coast of the United States is particularly vulnerable to devastation by major storms, chiefly hurricanes. From early times the region has suffered localized devastation resulting from fierce tropical weather systems. The destruction of commercial and residential property, damage to the seacoast fortification system, and disruption of the natural environment have been reported by Engineers since 1815.

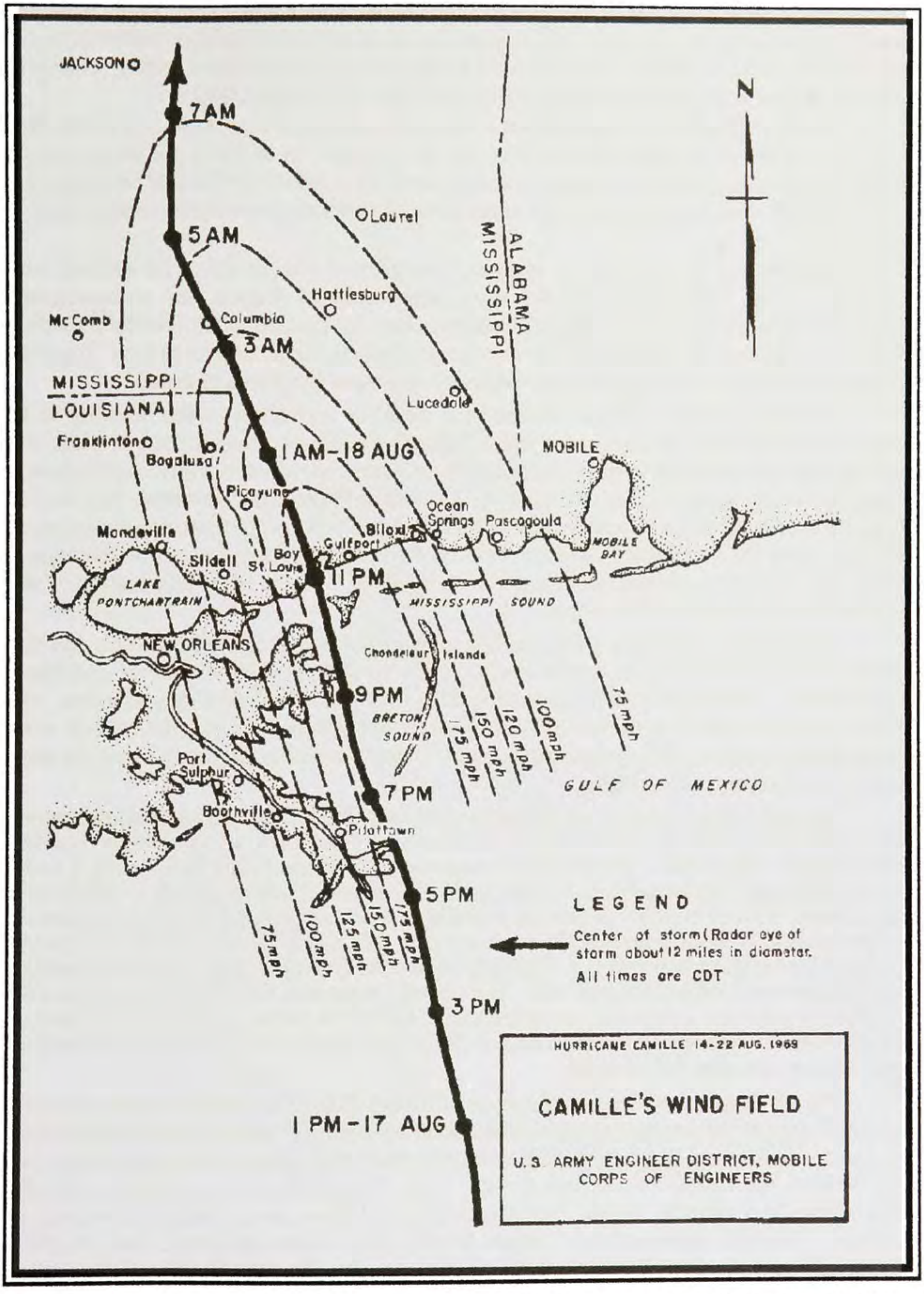
On 17 August 1969, the small but intense Hurricane Camille passed the mouth of the Mississippi River; its eye crossed the Mississippi coast around midnight the same day in the vicinity of Waveland-Bay Saint Louis (Map 9-5). The highest winds were estimated at 200 miles per hour, and the storm left an estimated $950 million in damages to public and private property (Figure 9-4) and 144 people dead.[81] Between 14 and 17 August, Camille followed on erratic path. Shortly after entering the Gulf of Mexico, the storm's winds increased to 115 miles per hour. By the time the storm was 200 miles southeast of New Orleans, its winds were 160 miles per hour and intensifying. By early afternoon on the seventeenth, reconnaissance planes estimated winds near the eye at 190 miles per hours; tides were predicted to be 20 feet above normal and immediate evacuation of low-lying coastal areas was urged.

When the storm moved inland on 17 August, its wind speeds were gusting to an estimated 200 miles per hour near the center (Map 9-6). The storm moved almost due north across Mississippi, diminishing rapidly in intensity as it traveled inland. By the early morning hours of 18 August, the worst part of the storm was over for the Gulf coast – although the weather system caused considerable damage as it tracked across the eastern half of the



Map 9-5. The path of Hurricane Camille, 1969 (*Hurricane Camille Report*, MDO).

Figure 9-4. Destruction by Hurricane Camille, Harrison County, Mississippi (Public Affairs, MDO).



Map 9-6. Hurricane Camille's wind field, 1969 (*Hurricane Camille Report*, MDO).

United States — and the first damage assessments could be made. The Mississippi Gulf coast was in shambles. The immediate coastal area from Ocean Springs westward to the vicinity of Clermont Harbor, adjacent to U.S. Highway 90, was almost totally destroyed. Damage abated in the areas stretching away from this core region (Map 9-7).

District activities during Hurricane Camille established important procedures that were used when subsequent hurricanes struck the District. In addition, the storm and its resulting destruction of life and property underscored the value of an effective early warning system. The District took a lead in the preparation of emergency evacuation and assistance planning.

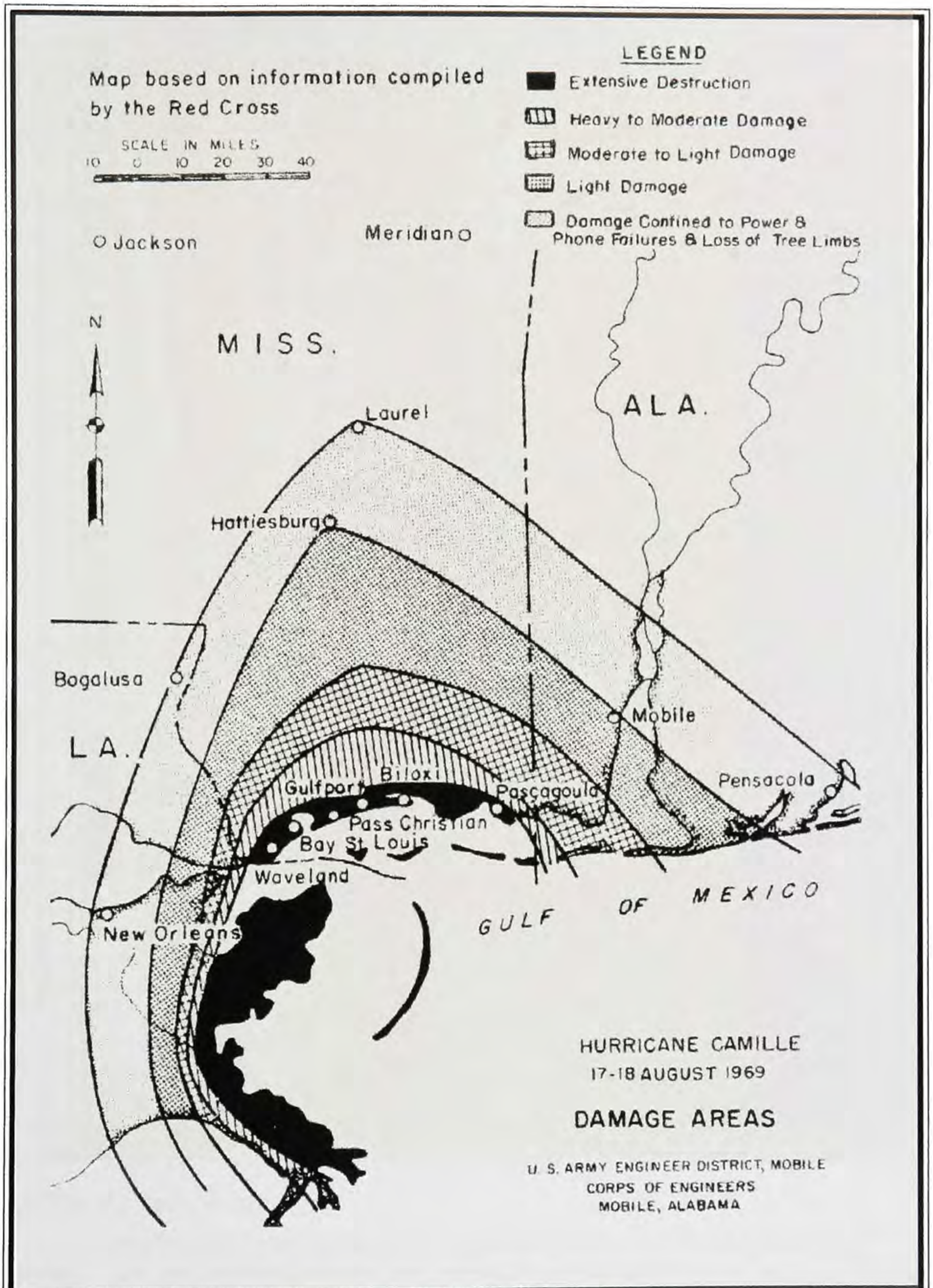
The District already had an internal, three-phased plan in effect for dealing with hurricanes. The first advisory on the storm was issued 14 August, and an emergency operations plan was activated. Phase I finalized plans for protecting the District's floating plant.[82] In addition, all contractors involved on projects in threatened areas were informed to take precautions. Emergency power supplies also were checked and tested.

Phases II and III of the Hurricane Plan were put into effect on the morning of 16 August. By this time the storm was about 380 miles south of Panama City, Florida, and moving north-northwest at 10 miles per hour (Phase II goes into effect in a serious emergency; Phase III in a designated major emergency). As soon as Phase II was initiated, the Chief of Operations ordered that all floating plant be removed to predesignated safe mooring sites; at the same time the Operations Division went on 24-hour alert. Contractors with exposed plant were warned to take precautions and were supplied with the latest information on the location and movement of the storm.

All District operations went on high alert as the day progressed. South Atlantic Division (SAD) headquarters was alerted to the impending danger to District operations and property. Around noon on the seventeenth the field office in Tuscaloosa, Alabama, was placed on alert when it appeared likely that the storm would veer into the Mobile area; Phase III was initiated. The storm continued on its north-northwesterly path, however, until making landfall around midnight.

The following morning the Operations Division began the arduous and dangerous task of assessing damage, which meant maneuvering through streets and highways that were clogged with debris. Ground teams were assisted by one flying team, using a Coast Guard helicopter.[83] Reports began to filter in slowly because communications were virtually nonexistent. East of Mobile the damage was slight, but in a westward direction destruction became near total in some parts of the coast between Biloxi and Clermont Harbor (Figure 9-5). Nearly everything between U.S. Highway 90 and the Gulf was gone. Excessive damage extended several blocks inland as well. The damage extended inland for miles; at least 26 Mississippi counties, 2 Alabama counties, and 4 Louisiana parishes suffered wind and/or flood damage. The greatest flood damage in the Mobile District was in Hancock, Harrison, and Jackson Counties, Mississippi.

On 18 August, the District Engineer, Colonel Robert E. Snetzer, made an aerial reconnaissance of the damage between Mobile and New Orleans. Snetzer's staff then assessed the damage to date and began preparing operation plans, anticipating notification from OEP that the area was declared a national disaster zone. Preparation for coordination with the Mississippi Civil Defense began. In the meantime, a liaison person from OEP arrived in Gulfport. The OEP representative, Colonel Snetzer, and Colonel Herbert R. Haar, Jr. (New Orleans' District Engineer), met the next day to apportion disaster cleanup efforts. New Orleans District was to handle operations for the parishes in Louisiana that were part of the Mobile District; Mobile District assumed responsibility for all counties in Mississippi, regardless of District boundaries.[84]



Map 9-7. The damage zones associated with Hurricane Camille (*Hurricane Camille Report*, MDO).

Figure 9-5. Destruction by Hurricane Camille between Pass Christian and Henderson Point, Mississippi, 1969 (Public Affairs, MDO).

Following the request from OEP, Mobile's disaster recovery plan went into effect. The District's recovery mission consisted of six categories: debris clearance; protective, health, and sanitation measures; repair of streets, roads, and bridges; dikes, levees, and drainage facilities; repair of public buildings and related equipment; and public utilities restoration.

The relief and recovery operation following Hurricane Camille was the largest operation of its kind the District had ever undertaken; at its peak more than 3,800 people were involved. Over 2,100 pieces of equipment were used including 800 dump trucks, 200 loaders, 175 bulldozers, 70 cranes, and 500 chain saws.[85] The debris removal phase lasted from 20 August to 22 November 1969 and by 31 December 1969 the Mobile District Engineers' mission was approximately 80 percent complete. Final inspection of repairs and payments for work completed continued into late 1970. Removing the debris left from the destruction of thousands of homes was by far the District's most difficult task. Communications were severely hampered and some areas were inaccessible. In addition, public utilities were destroyed over large areas, and debris hampered access to utility easements for restoration. Fortunately, as a military organization, the Corps could call on the vast personnel resources of the Department of Defense. Among the military units involved were the twentieth Naval Construction Regiment (Seabees) stationed at Gulfport; and the 43rd Engineer Battalion (Construction) and the 818th Engineer Battalion, Company D (Reinforced), both from Fort Benning.

Debris removal activity was divided into three phases and within 10 days more than 586 miles of roads, streets, and utility rights-of-way were cleared for traffic and utility restoration. Most of this work was accomplished by military units. To clear public property and more than 2,400 miles of roads and streets, a total of 313,300 tons of debris was removed by military units and private contractors (Figure 9-6).[86]

The District faced a host of problems throughout implementation of its recovery operations. Displaced persons needed housing, public buildings were structurally damaged and posed safety hazards, and standing water created breeding areas for mosquitoes. Electric power and communications essential for public health were destroyed and emergency units had to be provided.[87]

In the flooded area left by Hurricane Camille, over 3,800 homes and businesses were completely destroyed and nearly 16,000 sustained some form of damage; outside the flooded area an additional 26,000 homes and 1,000 businesses were destroyed or damaged.[88] The long-term economic damage was evidenced by the many commercial establishments destroyed along the 75-mile coast. Harrison County was hardest hit with nearly 400 establishments damaged and over 250 destroyed.[89] The story, of course, was repeated all along the coast. Total damage to commercial establishments in and out of the flooded areas amounted to more than $88 million; damage to residences was $139 million. There was also damage in the millions to industrial plants, churches, schools, and hospitals.

District Project Damage

Thirteen navigation projects within the Mobile District sustained varying degrees of damage, most notably Gulfport Harbor, where the storm surge swept ships from their moorings.[90] Wharf damage was heavy and the waterfront was in effect destroyed. Though less severe, damage was also sustained at Pascagoula, Biloxi, Pass Christian, and Mobile Harbors, and to the Intracoastal Waterway. In excess of $350 million in damage occurred in flooded areas and an additional $183 million in nonflooded areas.[91]

Figure 9-6. Removal of debris left by Hurricane Camille, 1969 (Public Affairs, MDO).

Lessons learned from this disaster helped to improve the District's preparedness for future calamities. Hurricane Camille was a major disaster in which some infrequently used public laws were applied. For example, P. L. 91-79 (29 June 1945) provided, under certain circumstances, for the removal of debris or timber from private property and waters. But application procedures were unclear; this problem was compounded by insufficient boundary surveys, lack of firm OEP guidelines, and problems with inadequately trained and inexperienced personnel. The net result was inefficiency in some areas of operation.[92]

Nevertheless, the Mobile District efforts overall were a success. Future disaster relief and recovery efforts were improved because of the Districts range of activities. The fact was made clear to many people both within and outside the Corps that procedures for handling another natural disaster of the magnitude of Hurricane Camille would require additional planning and policy development. The Mobile District had competently handled one of the nation's worst disaster recovery operations, and the public had benefitted. The District's multiphased hurricane operations plan was implemented effectively; the damage to projects in the District was attributable only to the magnitude of the storm. New procedures for disaster recovery were necessary, however, in light of the lessons learned.

The public became more sensitized to Gulf storm warnings and advisories from the Corps and other Federal agencies. From this time forward, the public had a new appreciation of the Mobile District's role in warning, evacuation planning and implementation, and disaster recovery activities.

Expanding Responsibilities, 1939-1970: Notes

1 Thomas M. Clement, Jr., Glenn Lopez, and Pamela T. Mountain, *Engineering a Victory for Our Environment: A Citizen's Guide to the U.S. Army Corps of Engineers* (Washington, DC: The Institute for the Study of Health and Society, 1971), no pagination. Citation is from the fifth page of the introduction.

2 Ibid.

3 Beatrice Hort Holmes, *A History of Federal Water Resources Programs, 1800-1969*, Department of Agriculture, Miscellaneous Publication No. 1233, (Washington, D.C.: GPO, 1972), p.5. Hereafter cited as Holmes-1233.

4 Ibid., p.9.

5 Ibid., p.10.

6 Ibid., p.13.

7 Ibid., p.16.

8 Ibid., p. 26; see also Lt. Gen. W.C. Gribble, Jr., "Perspectives on the Army Engineers Water Management Mission," *Water Spectrum*, Volume 6, No. 3 (Fall 1974): p. 2.

9 Gribble, "Perspectives,", p.2.

10 Ibid.

11 Gilbert F. White, ed., *Papers on Flood Problems*, University of Chicago, Department of Geography, Research Paper No. 70 (Chicago, IL: University of Chicago Press, 1961).

12 Keith W. Muckleston, "The Evolution of Approaches to Flood Damage Reduction," *Journal of Soil and Water Conservation*, Volume 31, No. 2 (March-April 1976), p. 53.

13 Beatrice Hort Holmes, *History of Federal Water Resources Programs and Policies, 1961-1970,* Department of Agriculture, Miscellaneous Publication No. 1379 (Washington, D.C.: GPO, 1979), pp.111-113. Hereafter cited as Holmes - 1379.

14 *ARCE, 1940, p.834.* A compilation of the status of all investigations for flood control projects in the district is included. See also Davis, *Mobile District History*, p.84.

15 *ARCE, 1941*, pp.790-791.

16 *ARCE, 1945*, pp.860-862.

17 L. L. Knight, *The Mobile District: Reorientation to the Space Age*, 1963, p.11.

18 Ibid., p.13.

19 Ibid.

20 *ARCE, 1948*, p.1006. Specific information for this project is similarly taken from the summary of operations contained within each year's Annual Report from the District.

21 *ARCE, 1951*, p. 750.

22 *ARCE, 1954*, p.450.

23 *ARCE, 1949*, pp.882-883.

24 Ibid., p.886.

[25] *ARCE, 1953*, p.640.

[26] Knight, *The Mobile District*, Table III, p.14.

[27] Ibid.

[28] Ibid., p. 14.

[29] Davis, *Mobile District History,* 1972, p. 88.

[30] Ibid.

[31] Ibid., p.87.

[32] *ARCE, 1962*, p.568.

[33] *ARCE, 1964*, p.468.

[34] *ARCE, 1954*, p.432.

[35] Ibid. pp. 433-434.

[36] *ARCE, 1963*, p. 507.

[37] *ARCE, 1966*, pp. 512-518.

[38] *ARCE, 1970*, pp. 348-351.

[39] *ARCE, 1953*, pp. 639-640.

[40] Ibid., p. 640.

[41] *ARCE, 1970*, p. 345.

[42] The complete two-volume history of the Tennessee-Tombigbee Waterway currently is unpublished. Volume I: James Kitchens, "An Outlet to the Gulf: The Tennessee-Tombigbee Waterway, 1571-1971" (unpublished manuscript, Office of History, Headquarters, U.S. Army Corps of Engineers); Volume II: Jeffrey K. Stine, "A History of the Tennessee-Tombigbee Waterway, 1970-1985" (draft manuscript, Office of History, Headquarters, U.S. Army Corps of Engineers). Although the Tenn-Tom is the largest navigation project of its kind ever completed, the District history will only cover the waterway within the overall context of ongoing civil works projects, without singling it out for special consideration.

[43] *ARCE, 1954*, p. 422.

[44] *ARCE, 1958*, pp. 473-483.

[45] *ARCE, 1964*, p. 502.

[46] Ibid., p. 500.

[47] *ARCE, 1970*, p. 3544.

[48] Ibid., p. 361.

[49] *ARCE, 1954*, p. 432.

[50] *ARCE, 1960*, p. 528.

[51] Ibid.

[52] Ibid., p. 529.

[53] U.S., Army, Corps of Engineers, *Report on Recreational Aspects of Civil Works: Water Resource Developments of the Corps of Engineers* (Washington, D C: Office of the Chief of Engineers, 1950), p. 7. This document was prepared for use by the

President's Water Resources Policy Commission. Hereafter cited as Corps of Engineers, *Report on Recreation*.

54 Ibid., p. 9.

55 *ARCE, 1953*, pp. 644-645.

56 *ARCE, 1950*, p. 903.

57 *ARCE, 1951*, p. 733..

58 *ARCE, 1952*, p. 690.

59 *Report on Recreation*, p. 45. The authority to construct and operate recreational facilities in reservoir areas under control of the War Department came under the Flood Control Act of 1946.

60 Martin Reuss, "History of the United States Water Resources Development," unpublished paper, Office of History, Headquarters, U.S. Army Corps of Engineers, January 1989. Several pertinent pages of this publication were provided by the Office of History but without pagination. The material is paraphrased liberally from the section entitled "Recreation."

61 Ibid.

62 Ibid. The Reuss manuscript relies on Darlene R. Roth and Stephen W. Grable, "History: Recreation in the S[outh] A[tlantic] D[ivision]," unpublished manuscript, Office of History, Headquarters, Chief of Engineers. Citation reference is only to the Reuss manuscript.

63 Ibid.

64 Ibid., section 3, p. 4.

65 Ibid.

66 *ARCE, 1968*, p. 394. For the 1970 figures, see ARCE, 1970, p. 351.

67 *ARCE, 1970*, p. 352.

68 *ARCE, 1970*, pp. 352-355.

69 U.S., Congress, Senate, Committee on Public Works, *Civil Works Program of the Corps of Engineers*. 89th Cong., 2d session, 1966. See "Future Workloads" pp. 74-80.

70 The actual figures indicate that recreation user-days more nearly doubled than tripled as was predicted. Still, the increased use of the reservoirs for recreation was impressive by any measure. Project visitation statistics provided by John Bowen, Environmental Branch, Mobile District Office, for recreation visitation on District projects between 1978 and 1985 shows a 7-year increase from 49,451,400 to 62,353,260 recreational user-days. The two most visited projects continue to be Allatoona and Lake Sidney Lanier. Walter F. George and West Point ranked third and fourth during the same period. Data came from CY 1986 NRMS and 6-Year Recreation Attendance/SAD.

71 U.S., Army Corps of Engineers, *Historical Vignettes* (Washington, DC: Historical Division, Office of the Chief of Engineers, 1985) p. 35. Hereafter cited as *Historical Vignettes*

72 Ibid., p. 39.

73 Samuel Davis Sturgi, Jr., "Floods, "The Annals of the American Academy of *Political and Social Science*, 309 (January 1957): 19. Hereafter cited as "Floods."

74 *Historical Vignettes*, 1985, pp. 35-40. See also U.S., Army, Corps of Engineers, *The History of the U.S. Army Corps of Engineers* (Washington, DC: GPO, 1986), pp. 48-49. Hereafter cited as *History, Corps of Engineers*. "Floods," 1957, p. 20; and Carter L. Burgess, "The Armed Forces in Disaster Relief," *The Annals of the American Academy of Political and Social Science*, 309 (January 1957): 72. Hereafter cited as "Armed Forces Disaster Relief."

75 "Floods," 1957, p. 20.

76 *History, Corps of Engineers*, 1986(?), p.51. An additional important source for the evolution of the government's flood control policy is Martin Reuss and Paul K. Walker, *Financing Water Resources Development: A Brief History* (Washington, DC: Historical Division, Office of the Chief of Engineers, 1983), pp. 27-31.

77 "Armed Forces in Disaster Relief," 1957, p.75.

78 *Civil Works Program*, 1966, p. 131.

79 Although procedures for implementing Federal disaster assistance have changed, primarily because of reorganization, refinement, and expansion of services under FEMA, the basic format remains. Federal assistance comes after a request from local governments and is contingent upon presidential designation of a disaster area.

80 Ibid., p. 132.

81 *After Action Report, Hurricane Camille*, 17-18 August 1969, U.S. Army Engineer District, Mobile, AL, February 1970, p. vii. Hereafter cited as *Hurricane Camille Report*.

82 Ibid., p. 15.

83 Ibid., p. 17.

84 Ibid., p. 19.

85 Ibid., p. 57.

86 Ibid., p. 36.

87 Ibid., p. 42. Ten mobile generators, for example, were flown into Mobile District from McClellan AFB, California, to help provide emergency power until utilities could be restored.

88 *Report on Hurricane Camille, 14-22 August 1969*, U.S. Army, Corps of Engineers, Mobile District, AL, May 1970, p. 37.

89 Ibid., p. 42.

90 Ibid., p. 57.

91 Ibid., pp. 66-67.

92 *Hurricane Camille, After Action Report, Supplement No. 1*, U.S. Army Engineer District, Mobile, AL, June 1971, pp. 43-49.

X. A New Direction for the Mobile District: The Environmental Era, 1970-1985

Because it is the chief Federal agency responsible for water resources development, the Corps' water resources program had a pervasive effect on the environment.[1] Public awareness of environmental harm resulting from Corps water resources development escalated in the 1960s. Increasing negative public sentiment against the Corps' management of the nation's water resources accounted in part for passage in 1969 of the National Environmental Policy Act.[2] During the 1970s, the Corps was engaged in a sweeping reexamination of its environmental policies. This reassessment gave rise to the Environmental Advisory Board, a group created to advise the Chief of Engineers on environmental issues, programs, and policies, and to contribute "to an enhanced mutual understanding and confidence between the Corps and both the general public and the conservation community."[3] The board was formed in April 1970 when Lieutenant General Frederick J. Clarke, Chief of Engineers, asked six distinguished environmentalists to become its charter members.[4] The creation of the Environmental Advisory Board followed 70 years of gradually expanding responsibility for the maintenance of the nation's waterways.

Note: Because the Corps of Engineers acts in response to mandates created by legislation, its role is constantly evolving through changes in national policy established by the Executive, Legislative, and Judicial Branches of the government regarding water resources. Likewise, the Corps' responsibilities for environmental regulation are constantly redefined. Hence, the material contained in this chapter reflects directions set for the Corps in its environmental role through 1985, the last year covered in this history.

Evolution of Regulatory Authority

The Corps' regulatory authority for water resources grew out of the Rivers and Harbors Appropriation Act of 1899. The act served as the basis for regulating the nation's waterways for the next 70 years, and its clear intent was to protect navigation.[5] Sections 9 through 20 made the Corps responsible for ensuring against actions that would impair navigation, a task monitored through a complex permit system.

No dam, fish weir, bridge, causeway, or dike, for example, could be built across any navigable stream. Section 10 relates to any work performed in navigable waters and is used to regulate dredging and filling operations, as well as construction of piers, wharves, and bulkheads. Section 13 became known as the "Refuse Act" because it forbade the dumping of any waste or material, except liquid sewage, into navigable waters without first getting a permit from the Chief of Engineers.

The definition of navigable waterways would become an issue in later years, and Corps jurisdiction began to extend outside immediate navigable waters. The legislation authorized permit control of discharges into tributaries of navigable waters, thus the Department of the Army began of regulating activities under Section 10 of the 1899 act that "may affect the course, location, condition, and navigable capacity of the navigable water of the United States."[6]

The general public did not greet the Corps' expanding regulatory authority with total enthusiasm. Historically, the special relationship of the Corps to the Army to the executive and legislative branches of the government gave the Corps high visibility. Following a period when the mission of the Corps was equated with robust national expansion, some skepticism emerged about the Engineers' apparent philosophy of "build, build, build."[7]

In a 1951 book, Arthur Maas castigated the Corps for contributing to problems on the nation's waterways.[8] His book exposed the Corps to public scrutiny and criticism from environmentalists. By the late 1950s, the environmentalist's opposition to the Corps' civil works program got the attention of Congress. However, passage of environmentally oriented legislation like the Fish and Wildlife Coordination Act of 1956 did not assuage the public, which perceived this act and similar amendments in the 1960s as simply efforts to placate the public. In the absence of evidence of serious intent to investigate claims against the Engineers or to curb its authority, public resentment increased.[9]

By the late 1960s, the conflict between public interest and Corps mission was on a collision course. In 1968 Supreme Court Justice William O. Douglas, one of the nation's most influential conservationists, labeled the Corps of Engineers as "public enemy number one."[10] Justice Douglas's indictment was rephrased and sharpened in the early 1970s when Elizabeth Drew, Washington editor of *The Atlantic*, wrote an article for the magazine accusing the Corps of participating in pork barrel projects.[11] The magazine sent Maas a copy of the article for comment. Although still one of the agency's chief critics, he was not willing to blame the Corps entirely for doing what Americans wanted done in the first place.[12] Maas commented that as popular attitudes changed over the years, Corps procedures were altered to accommodate public concerns. Maas gave a fair assessment of the Corps' new direction. In response to pressures from Congress, the general public, and the courts, the Corps had ceased to be an "indulgent, laissez-faire regulator" and had become an "active, critical overseer of activities at the land-water margin."[13]

The National Environmental Policy Act (NEPA)

The implementation of NEPA in 1970 created a "whole new ball game" for the Corps of Engineers.[14] One of the major responsibilities resulting from the act was the requirement that an environmental impact statement (EIS) be formatted for any project that might have a possible environmental impact. Because the law was retroactive, all projects under construction had to be assessed; authorized projects that were delayed by lack of funding also required an EIS. Hence, the Corps assumed an enormous responsibility in addition to that of developing the nation's waterways. For the Mobile District, the EIS provision was particularly complicated because of the construction of the Tenn-Tom Waterway. Controversial before any construction began, Tenn-Tom was to be the most thoroughly scrutinized project in the history of the Mobile District, and possibly in the history of the Corps.

By 1972, major revisions to the Federal Water Pollution Control Act (FWPCA) were passed. Although the first such act was passed in 1948 it failed to stem proliferating water pollution. Because the 1948 act was amended five times, the 1972 amendments in effect constituted a complete rewriting of the past laws.[15]

In order to deal with the rapidly escalating administrative procedures resulting from the passage of NEPA, the Environmental Advisory Board was asked to do the following:

- Examine the Corps' environmental program policies and procedures, existing and proposed, and identify problems and weaknesses and suggest ways of improving them
- Advise the Corps on how to improve working relations with the public, and particularly with conservation groups
- Give advice on environmental problems or issues connected to specific plans or programs

- View its responsibilities in the context of present and future conditions

In addition, the Chief of Engineers in 1970 issued a new policy statement on the environment supporting the organization's new direction. Four general objectives of the policy were incorporated into the guidelines governing the civil works program:

- To preserve unique and important ecological, aesthetic, and cultural values of our national heritage
- To conserve and use wisely the natural resources of our nation for the benefit of present and future generations
- To enhance, maintain, and restore the natural and manmade environment in terms of its productivity, variety, spaciousness, beauty, and other measures of quality
- To create new opportunities for the American people to use and enjoy their environment[16]

The 1972 amendments to the FWPCA significantly affected the Corps' regulatory function. Congress enacted the amendments "to restore and maintain the chemical, physical, and biological integrity of the Nation's Waters."[17] The national goal was to eliminate the discharge of pollutants into the navigable waters of the nation by 1985. Sections 301 and 402 are the principal mechanism for achieving the national goal via the National Pollutant Discharge Elimination System (NPDES), with its goal of stopping pollution at its source. Section 402 was the vehicle that authorized the Environmental Protection Agency (EPA) to administer the NPDES program by controlling the discharge of pollutants into the waters of the United States, to include territorial seas as well. The act, therefore, had far-reaching scope.

The pollutants defined in the act include dredged material, rock, sand, and cellar dirt and thus created a potential overlap between the regulatory authorities of the Corps and the EPA. To circumvent this problem, Congress included Section 404. This section authorized the Secretary of the Army, through the Corps of Engineers, to regulate discharges of dredged or fill material into the nation's waters.[18] The Corps' new authority included wetlands as well.

Important changes in the implementation of Section 404 affected the Mobile District in the mid-1970s. Beginning around 1975, a national sensitivity to the loss of the nation's wetlands emerged. Millions of acres had been lost through conversion to other uses, most commonly drainage for agricultural use and other kinds of development. In 1977, the Clean Water Act made it official policy that all Federal agencies conserve and protect wetlands.[19]

The expansion of the definition for "navigable waters" became an explosive environmental issue.[20] The former definition, as set forth in the Rivers and Harbors Act of 1899 and which affected navigable streams and their tributaries, went through a lexicographic exercise in which the meaning of "navigability" progressed from waters in use "to those which used to be navigable," to those which "reasonable improvements" could make navigable, to "nonnavigable tributaries affecting navigable streams."[21]

The 1972 amendments tested in court cases extended jurisdiction to a nonnavigable stream; a nonnavigable, manmade mosquito canal; and mangrove wetlands and other swamplands above the mean high water line. The interpretation of permit jurisdiction with respect to the definition of navigable waters was so controversial that in 1975 the Corps adopted new definitions of "navigable waters" for the purpose of administering its Section 404 authority.[22] In coastal regions, the Corps now claims jurisdiction over waters subject to tidal ebb and flow and over coastal and freshwater wetlands alongside traditional navigable waters. The new authority extends to inland waters such as intrastate lakes and streams that are used for interstate purposes (such as recreation or industry).[23]

The implementation of the regulatory functions under the 1972 and later amendments is an ongoing process. The requirement of an EIS for all civil projects continues to be costly and time consuming. The courts have been aggressive in ensuring that adequate environmental assessments are prepared for civil projects. The scope of EIS submittals, ranges from simple disclaimers to massive documents. As a result, the workload of the Mobile District has been increased significantly.

The public now has a mechanism for voicing objections or suggesting changes before any civil project is authorized for construction. The Corps has become something of a champion of the environmentalists and an antagonist to its old constituent - the developers.[24] As a mediator for public interests, the Corps is called on to mediate conflicts over use of resources. District Engineers now have to consider economics, aesthetics, conservation, history, navigation, water quality, and cultural and environmental values when making project decisions.

The permit procedure whereby all parties can have input before a decision is made constitutes one of the major strengths of the present regulatory process, although implementation is increasingly complex.[25] The lack of clearly defined oversight authority is still being debated. Nevertheless, the Corps' regulatory program is well designed to protect wetlands and other natural systems within certain parameters.[26]

Regulatory Impact on the Mobile District

For the Mobile District, increased regulations were accompanied by an increase in required permits before the environment could be altered, even to a negligible degree. The Corps was now just as likely to stop development as it was to rule favorably by granting a permit to construct. Thousands of additional permit applications meant an avalanche of paperwork. As the workload grew, so did the need for increased manpower.

With its geographic diversity, the Mobile District contains multiple environments subject to protection under the environmental legislation of the 1970s. The numerous streams and rivers, bogs, swamps, coastal marshes, barrier islands, and other wetland habitats found in the subtropical climate put excessive regulatory demands on the District's work force. As a result, the Mobile District has one of the highest workloads of any District in regards to conforming with environmental legislation.

By the mid-1970s, Mobile District's workload had increased to the point where one of two options had to be implemented: either more employees had to be hired or some of the workload associated with regulatory oversight had to be shifted to other Districts. As a result, regulatory authority for the Florida panhandle portion of the Mobile District was shifted to the Jacksonville District. The western portion of Georgia was assigned to the Savannah District, and ultimately a portion of Mississippi was assigned to the Vicksburg District.[27]

The 404 regulatory function presented problems for the Mobile District because of the two perspectives related to environmental regulation: (1) how regulation is going to affect an individual's right to develop private land and (2) how regulation affects the cost, scheduling, and maintenance of projects authorized by the Federal government.

There is often a divergence in how the Corps and the public views the Corps' responsibility. The public sees the Corps as responsible for protecting the total environment. In reality, the Corps must act to fully satisfy the law without accepting more or less than it has authority to regulate.

The Mobile District's record on regulatory success is mixed. While most of the environmental assessments and impact studies for projects within the District have withstood court challenges, the District has tended to avoid the controversial aspects of preparing EISs. When the Corps has been challenged legally in relation to a project or permit application, most often it is over an environmental aspect. While the EIS may satisfy the law, and fulfill the Corps' responsibility as prescribed by Congress, the public may perceive the document as incomplete or biased.

The Civil Works Program

The District's regulatory functions increased greatly after 1970. As stated earlier, the new environmental regulations meant that projects already under construction had to be reexamined and authorized projects had to be reassessed. The Corps' more comprehensive approach to development of water resources meant that some projects either partially or totally completed were deauthorized. Failure of commercial activity to increase following navigation improvement, environmental deterioration, and inability to secure local cost-sharing support or congressional funding are among the many reasons for deauthorization of projects. The average timetable in the late 1970s for a Corps project, from planning to completion, was almost 18 years.[28] The ongoing nature of projects has led to public charges of pork barrel politics played out through the funding process.[29] Nonetheless, Mobile District's civil works program continued to be robust through the mid-1980s with navigation improvements still leading in terms of project size and number.

Annual Reports indicate a degree of uniformity in the District's project workload by volume and distribution within the 3 main project purposes; navigation, flood control, and multipurpose projects. The financial obligation for individual projects varied widely, with the Tennessee-Tombigbee Waterway dominating all other projects in both cost and scale of construction.

Between 1970 and 1985 an average of 26 navigation projects per year were under construction. An average of 28 navigation projects were authorized but did not receive funding, were considered minor, were under consideration for deauthorization, or might be reduced in funding and scope of responsibility (such as dropping construction and retaining maintenance of whatever work had been accomplished to date). Flood control averaged six projects with a host of specially authorized smaller projects. The number of special authorizations for flood control projects nearly tripled between 1972 (with an average of 16) and 1982 (with an average of 42 special projects). Multipurpose projects averaged 14 per year, most of which were massive undertakings that took years to complete.

The various civil works projects accomplished in the Mobile District between 1970 and 1985 were a continuation of the diverse operations characteristic of the District over the preceding three decades. Importantly, the magnitude of the Tennessee-Tombigbee Waterway project and the controversy surrounding its conception, planning, and construction have overshadowed significant work in other river basins within the District. Tenn-Tom is only one of nearly 50 projects for which the Mobile District has a continuing obligation.

Routine dredging operations along the Gulf coast in bays, harbors, and rivers continue to be a vital part of the District's responsibility to maintain the navigability of the region's waterways. Silting of navigation channels and deposition of snags and other debris in waterways demand the District's attention. In addition, periodic alterations to the existing projects is necessary to ensure that channels are not only open, but that they are adjusted to handle vessels of larger dimensions.

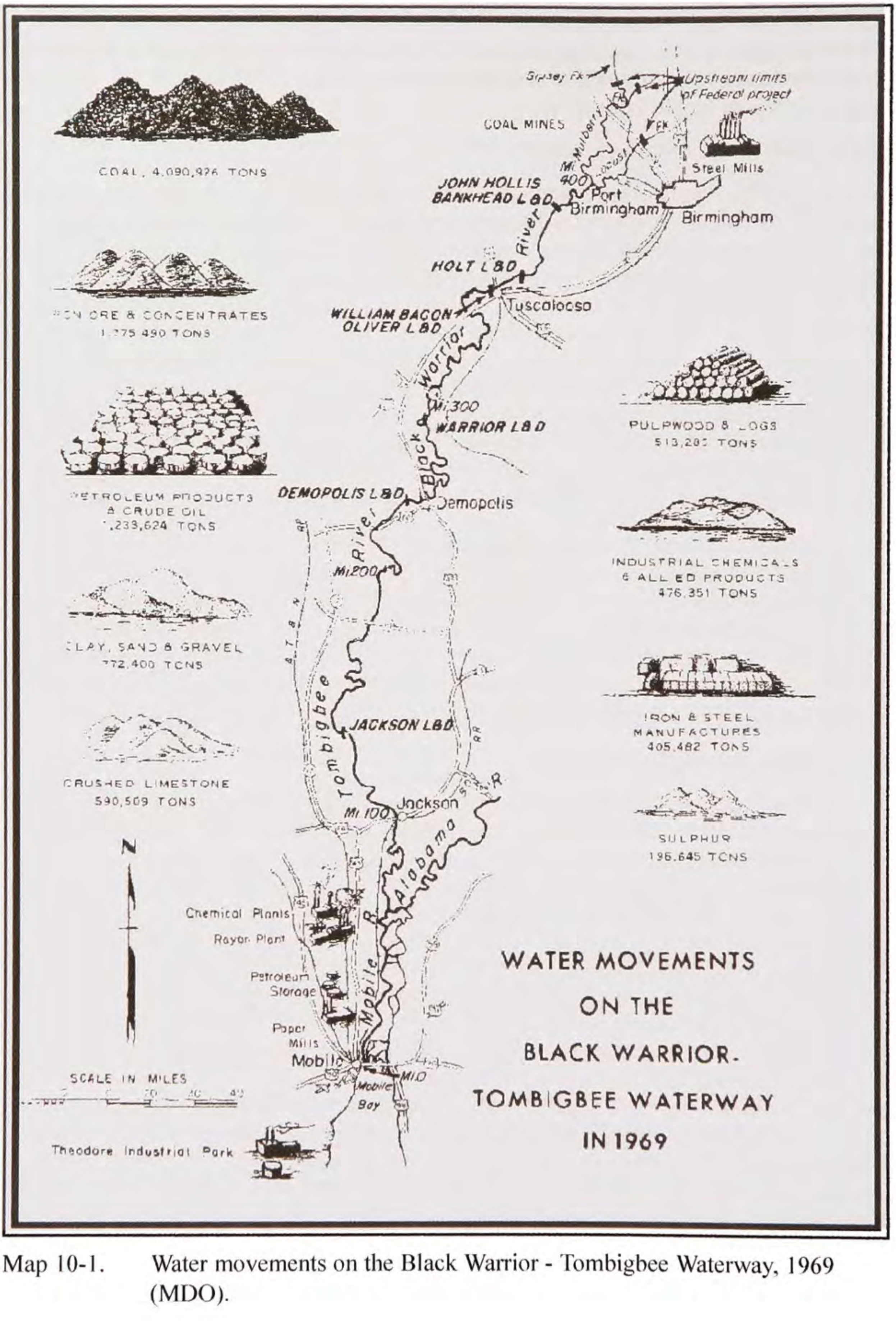
Black Warrior-Tombigbee River

Altering channel dimensions to accommodate larger vessels sometimes involves improving lock facilities on rivers throughout the District. The modernization program for locks and dams on the Black Warrior and Tombigbee Rivers in Alabama is typical of Mobile District efforts to keep inland navigation projects technologically current and capable of handling increased levels of cargo (Map 10-1). The original improvement project yielded 17 dams and 18 locks and was completed in 1915. Increased use and changing maritime technology created a demand for larger locks, and by mid-century a modernization project was well under way. The Oliver Lock and Dam (1939) at Tuscaloosa was the first segment of the new system to open, replacing three old locks (10, 11, and 12). The Demopolis Lock (1954) replaced Locks 4, 5, 6, and 7; the new Warrior Lock (1957) replaced Locks 8 and 9; and the Coffeeville Lock (1960) replaced Locks 1, 2, and 3. The Holt Lock replaced the last four of the old locks (13, 14, 15, and 16) when it was opened in 1968 (Figure 10-1).

New improvements continued through the 1970s. Rehabilitation of the spillway at Bankhead Lock and Dam was completed in February 1970; in April new construction commenced to replace the double lift lock with a single lift. In addition, recreation facilities were provided at Holt, Warrior, Demopolis, and Coffeeville locks and dams. Over 1.3 million recreational user days were recorded at these facilities in 1970.[30] By 1986, the number of recreational visitors numbered 6.8 million.[31] In addition to the recreational facilities, a 4,200 acre wildlife refuge at the Coffeeville Lock was authorized in 1960.

Tennessee-Tombigbee Waterway

The Tenn-Tom Waterway project is the largest civil works project of its kind in North America, and its history has been both complex and controversial.[32] As to construction, Tenn-Tom has many similarities to the lock and dam projects accomplished on other rivers throughout the District, but there are substantial differences as well. Certainly the quantity of earth moved, the thousands of man-hours expended, and the hundreds of millions of dollars invested are without equal in the District. Numerous different tasks had to be coordinated along the 253-mile corridor. This complexity of operations caused faulty communications that in turn contributed to project setbacks. Formal dedication ceremonies to initiate construction of the waterway were held in Mobile on 25 May 1971, with President Richard Nixon giving the keynote address. Construction began on the Gainesville Lock and Dam, the lowermost structure on the system, in the fall of 1972. Progress was slowed and costs mounted. By 1974 over $25 million had been invested, and the project was about 4 percent complete. By September 1977 over $205 million had been spent on the waterway, which was only 15 percent complete.[33] By 1980 the project was 48 percent complete, including the work being done by the Nashville District in the divide cut portion of the corridor where the waterway would connect to the Tennessee River. Nearly a half billion dollars was invested.[34] By the time the waterway opened to navigation in 1985, over $1.5 billion had been invested.[35] The project was completed ahead of schedule and on 14 January 1985 the *Eddie Waxler* was the first commercial carrier to move through the waterway. Official dedication ceremonies were held in June 1985.[36]



Map 10-1. Water movements on the Black Warrior - Tombigbee Waterway, 1969 (MDO).

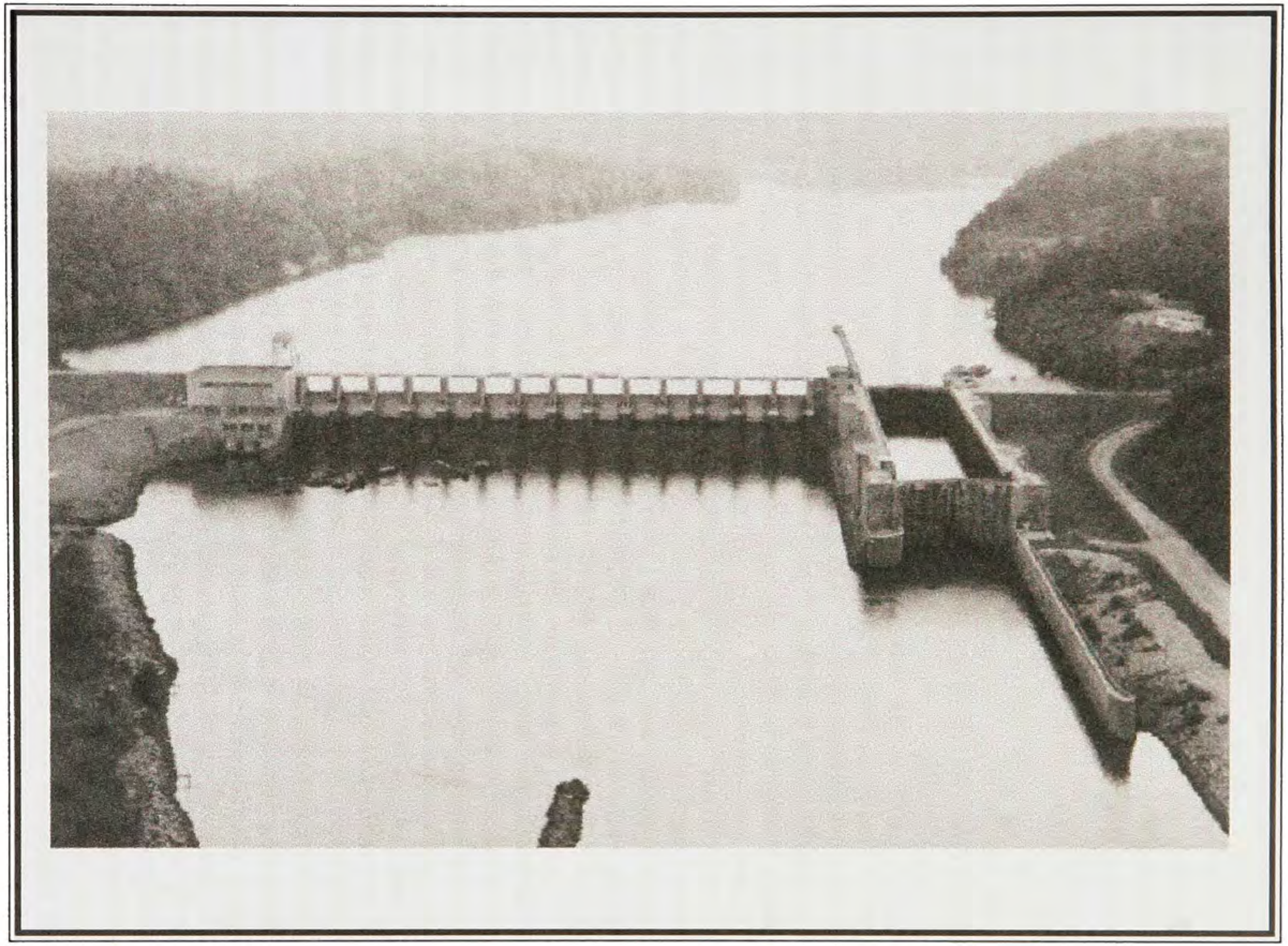


Figure 10-1. Holt Lock and Dam, Black Warrior River, Alabama (Public Affairs, MDO).

The Tenn-Tom Waterway project was the most important civil project during the 1970s and 1980s to include cultural resource management. An important regulatory function of the Corps, cultural resource management is a responsibility authorized by the National Historic Preservation Act of 1966, as amended in 1980. The act, under which cultural resources are identified and assessed, serves to minimize loss of information determined vital to an understanding of the cultural fabric of the District. The Mobile District's Planning Division is responsible for inventory studies, assessment of properties, and a host of other jobs related to enforcing the Preservation Act. The Planning Division's Environmental Resources Section is responsible for cultural resources management throughout the District. Although the District has a strong project management program, the controversial Tenn-Tom Waterway caused critics to scrutinize the Corps' water resources program more closely than was the case in other basins. To counter potential challenges, the District developed a major program to monitor the inventory, analysis, and mitigation for the Tenn-Tom. The Environmental Resources Section of the Planning Division, sensitive to the problems that an interrupted construction schedule would create, was able to accomplish consistently high-quality work under adverse conditions. One example was the District's success in mitigating sites for public benefit through cultural resource management. Despite public accusations that the project was destroying the region's heritage, the District's cultural resource management was notably successful in mitigating sites for public benefit. While the District had conducted cultural studies on a piecemeal basis for a number of years, a more comprehensive approach was instituted in the Tombigbee corridor. Tenn-Tom presented the opportunity to develop a cultural resource management program for an entire segment of a basin before any construction altered the cultural environment. Another important aspect of the Tenn-Tom program was the inclusive nature of its design. Interest in historic resources had previously tended to focus on prehistoric artifacts. The Tenn-Tom program included the broadest possible range of resource categories to ensure that necessary mitigation treated all categories equally. The program encompassed prehistoric archaeology; historic archaeology; underwater archaeology; oral history; general history of the area; historic buildings ranging from folk and vernacular architecture to formal architecture, including residential, nonresidential, and commercial structures; and historic engineering resources such as bridges, mill sites, and industrial sites. As part of its operation and maintenance function the Corps continues to manage cultural resources after project completion.

The Environmental Resources Section was challenged to find the personnel resources to accomplish the required surveys and inventories without delaying the planning and construction tasks. Given the time constraints for completion of all studies, the quality of work done by the scholars and other professionals in accomplishing the cultural resource management program contributed to the positive benefits of the Tenn-Tom Waterway.[37]

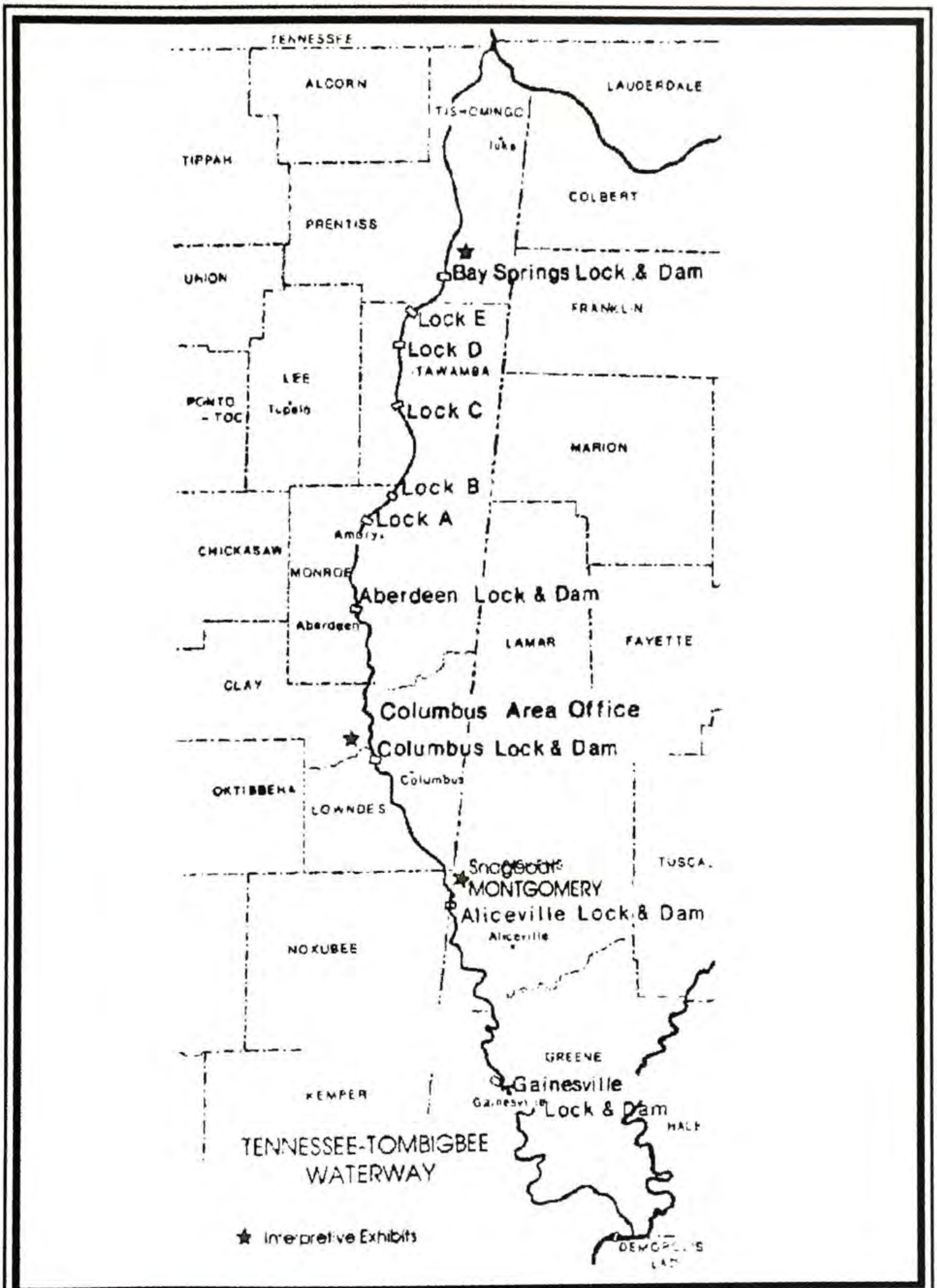
Now that the waterway is completed and open for navigation, the District monitors preserved sites to protect them from vandalism and erosion. The District also has developed interpretive displays at various sites along the corridor to enhance the public's knowledge about the region's human resources (Map 10-2).

Other Multipurpose Projects

During the 1970s and 1980s, other important civil works projects were initiated or completed throughout the District. As part of the comprehensive approach to river basin planning, multipurpose projects that include flood control, power generation, and recreation became important adjuncts to the traditional navigation improvement of any river system.

Apalachicola-Chattahoochee-Flint (ACF)

By the 1970s, a number of multipurpose reservoir projects were completed or under construction as part of the comprehensive plan for the ACF system. The environmentalists'



Map 10-2. Tennessee-Tombigbee Waterway Interpretive Centers (MDO).

general criticism associated with reservoir development also focused on work in the ACF corridor. Congress authorized construction of Sprewrell Bluff Lake, on the headwaters of the Flint River, as part of the comprehensive plan for the Flint River basin. Opposition to its construction, and withdrawal of state support by Jimmy Carter, then governor of Georgia, caused suspension of the project; it has since been deauthorized, along with Lazer Creek Lake and Lower Auchumpkee Creek Lake.[38]

One of the more important projects completed in the ACF basin was West Point Lake (Figure 10-2). The project was authorized in the early 1960s and construction was nearly complete in 1970. West Point Lake was the first project where Engineers used the "slurry trench" technique. The "slurry trench" serves as a membrane beneath the embankment to control seepage under the dam.[39] It was also the first to use hydraulic means to control tainter gates, and to use larger tainter gates as an economy measure.[40]

In addition to its engineering attributes, West Point Lake was the first demonstration lake designated by the Corps for the express purpose of recreational development. Previously, the development of recreational facilities was a spin-off of flood control and power. The lake's recreational designation in 1973 was partially intended to defuse growing public opposition to the Corps' water resources program. The purpose was to present "a wider variety of recreational facilities and opportunities for the public than normally provided at Corps lakes."[41] Because the lake was a demonstration project, the cost of providing recreational facilities was borne entirely by the Federal government instead of through cost sharing. The lake's location in an area with a dense urban population (over 4 million people live within a 50-mile radius of the lake), has attracted more than 6.9 million visitors each year.

Alabama-Coosa System

The comprehensive plan for development of the Alabama-Coosa system was amended in 1954 to permit non-Federal interests to develop the Coosa by constructing a series of dams. The dams were built primarily for power generation but within the context of an overall multipurpose design. Two examples are Millers Ferry Lock and Dam on the Alabama River (Figure 10-3) and Carters Dam and Lake on the Coosawattee River in northwest Georgia (Figure 10-4).

Carters Dam is different from the typical project design for most river systems in the District. It is an earth-filled dam, 452 feet high at its highest point and 2,053 feet long. The dam is similar to the Lewis Smith Dam on the headwaters of the Black Warrior-Tombigbee system in Alabama (Figure 10-5). The Lewis Smith Dam is an Alabama Power Company dam that is monitored by the Mobile District and is the second largest earth-filled dam east of the Mississippi River.

Construction on Carters Dam was initiated in 1962 but was not completed until 1979, although filling of the reservoir was initiated in 1974 and the first power was brought on line in mid-1975. The project's construction was one of the most extensive of its kind for an earth-filled dam and required some ingenious techniques for managing the river during the process. Water was diverted around the dam site by blasting a tunnel through the mountain (Figure 10-6).

The power generated by Carters Dam and the other projects along the Alabama-Coosa is sold by the Southeastern Power Administration of the Department of Energy. Since initiation of power generation at Carters Dam in 1976, over 5 billion kilowatt-hours (kw/hrs) of energy (net) has been generated; in 1986 net generation exceeded 450 million kw/hrs.[42]

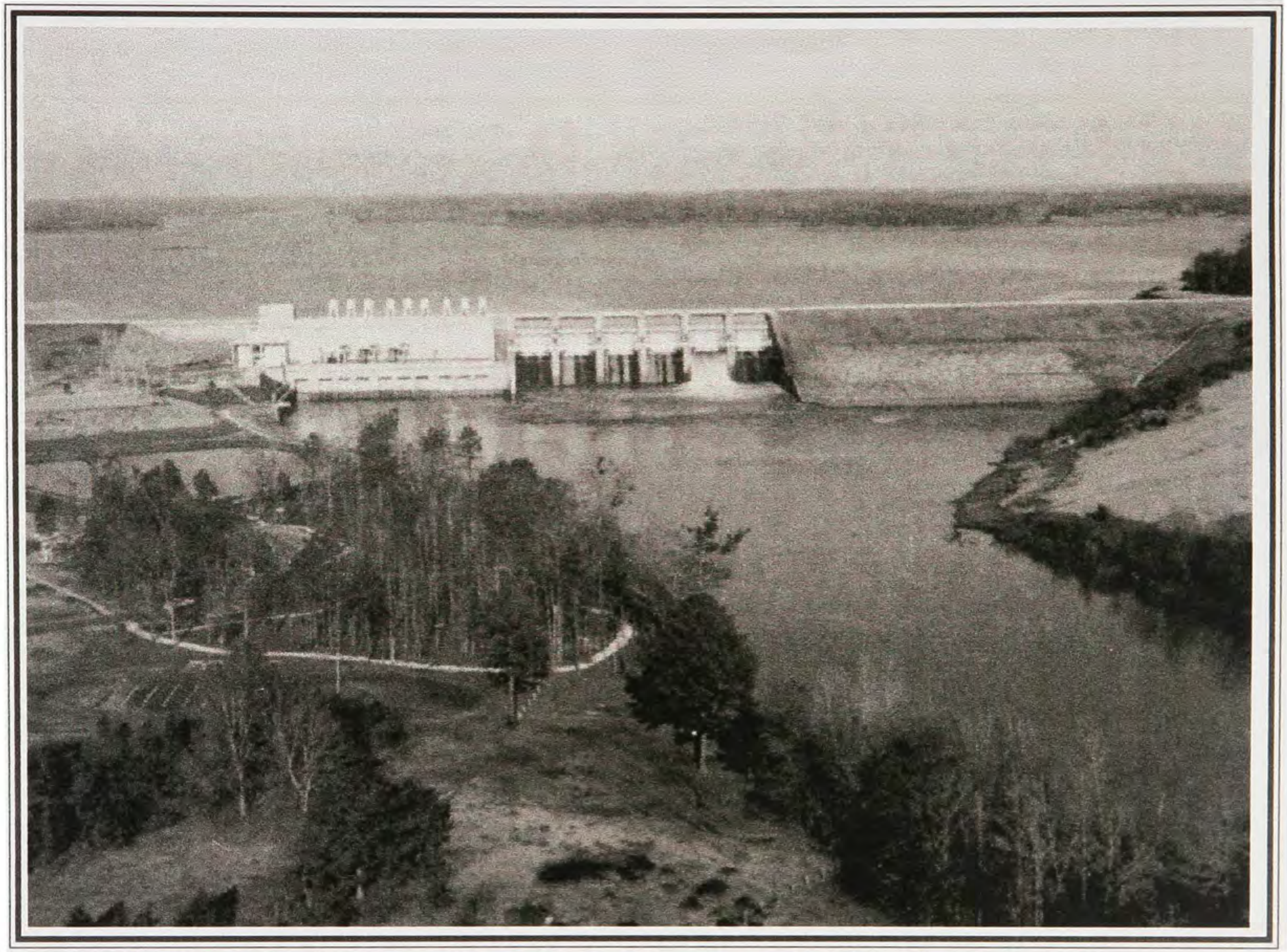


Figure 10-2. West Point Dam, Chattahoochee River, Alabama-Georgia (*Water Resources Development in Alabama 1987*, MDO).

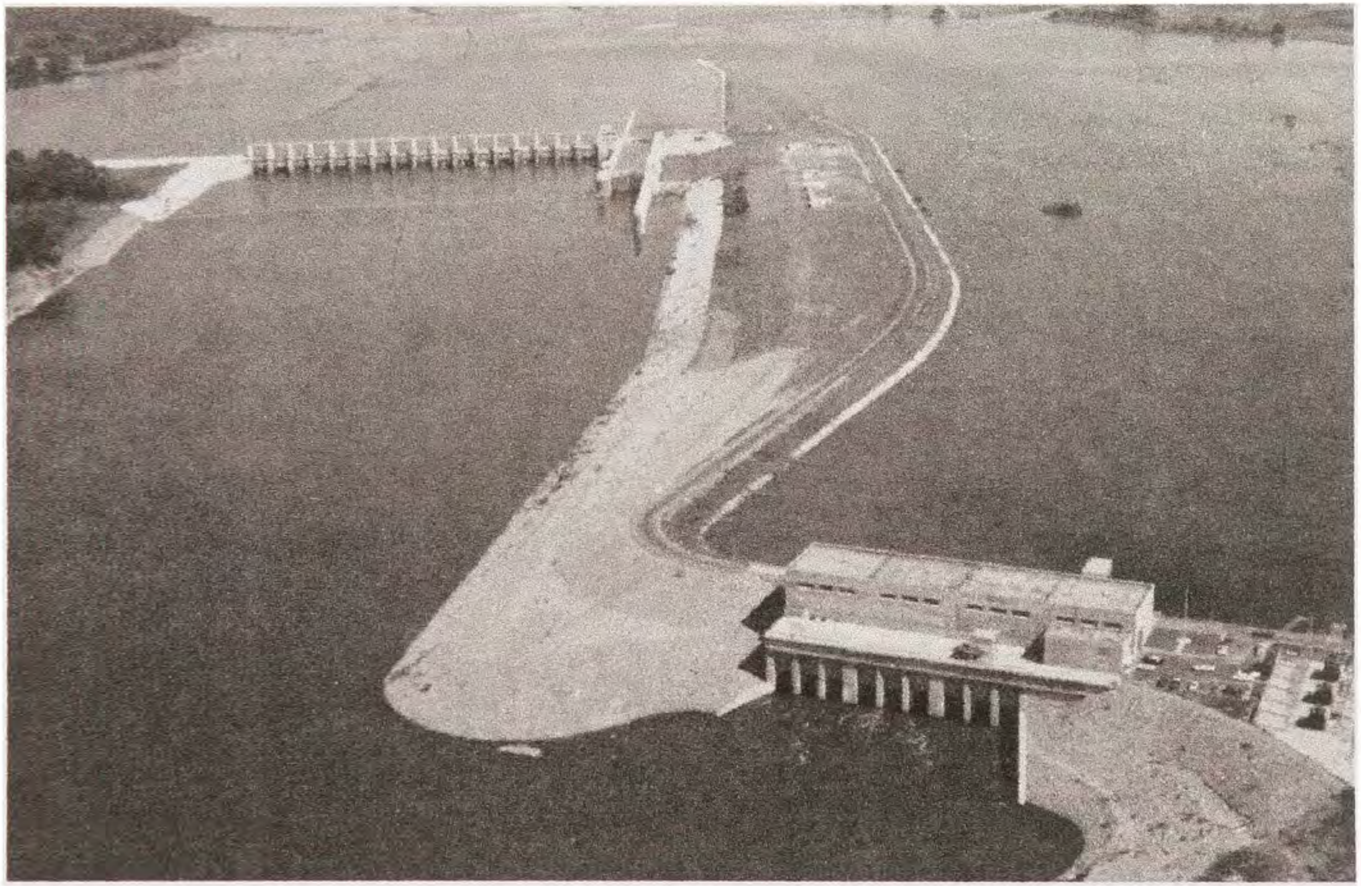


Figure 10-3. Millers Ferry Lock and Dam, Alabama River, Alabama (Public Affairs, MDO).

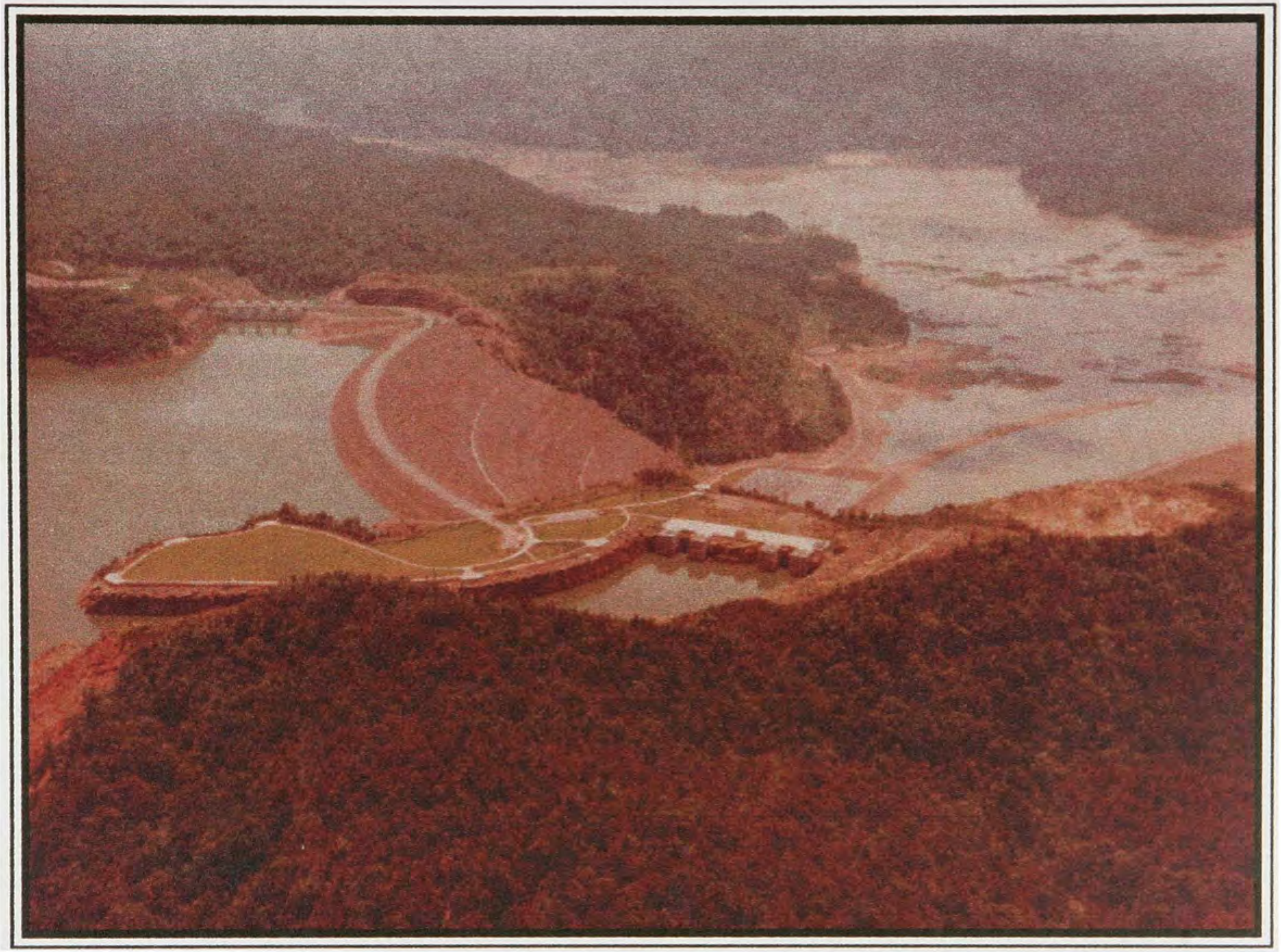


Figure 10-4. Carters Dam and Reservoir, Coosawattee River, Georgia (Public Affairs, MDO).

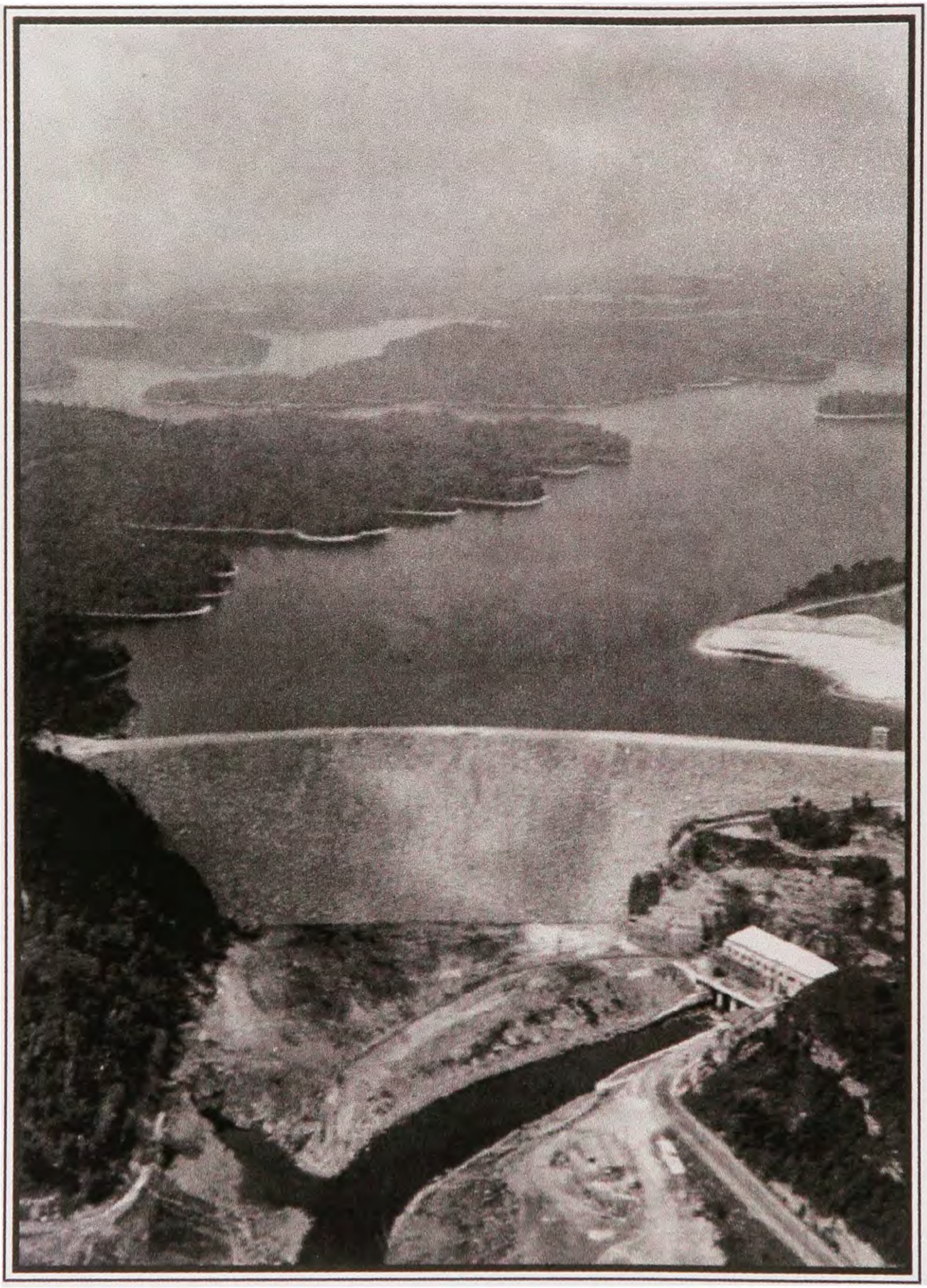


Figure 10-5. Lewis Smith Dam, Sipsey Fork River, Alabama (Public Affairs, MDO).

Figure 10-6. Carters Dam, Coosawattee River. Georgia, diversion tunnel (Public Affairs, MDO).

Inter-Basin Projects

The Mobile District participates in several inter-basin projects that share portions with other Districts. Chief among these is the GIWW, which was completed in 1937 and enlarged in 1943. The GIWW mainly serves light-draft vessels not suited to navigation in the open waters of the Gulf of Mexico. Commercial traffic has leveled off to approximately 100 million tons, and only minor fluctuations occurred in annual totals for all commerce between 1973 and 1985.[43] About 20 percent of the annual cargo moves between Mobile and New Orleans, and another 10 percent between Mobile and Pensacola.[44] Coal, gravel, chemicals, petroleum products and fertilizer are the principle commodities that flow through the GIWW.

The section of the GIWW in the Mobile District, however, has a significant recreational component in addition to its commercial function, particularly the section from Biloxi, Mississippi, eastward toward Tallahassee, Florida. Pleasure craft make major use of the waterway during the summer months and to a certain extent during the winter as well. The GIWW is also a significant connection between the Mississippi Test Facility (MTF) of the National Aeronautics and Space Administration (NASA) near Bay St. Louis, Mississippi, and NASA's manufacturing and assembly plant for space rockets at Michoud. The Mobile District handled development and maintenance of this part of the GIWW until October 1981, when responsibility was shifted to the Vicksburg District. In addition to responsibilities for the portions of the GIWW within its District, Mobile continues to participate in an aquatic plant control program that extends outside its boundaries. The subtropical climate of the coastal area fosters rapid and dense growth of aquatic plants that can adversely affect commercial navigation. The program was significantly expanded by the Rivers and Harbors Act of 1965 and calls for progressive eradication of water hyacinths, alligator weed, Eurasian *milfoil*, and other harmful water plants. The Corps works with Fish and Wildlife personnel and conservation agencies to ensure protection of the environment while preserving navigability of the District's waterways (Figure 10-7).

Hurricane Frederic

Hurricane Frederic caused widespread damage in the District on 12 and 13 September 1979. Under P. L. 84-99 (28 June 1955), the Corps was authorized to provide emergency assistance during floods. Many people on the Mississippi coast, and some members of the Mobile District office, relived the 1969 nightmare of Hurricane Camille. The greatest damage was inflicted across six counties bordering the Gulf coast: Jackson and Harrison Counties in Mississippi, Mobile and Baldwin Counties in Alabama, and Escambia and Santa Rosa counties in Florida (Map 10-3). The resort areas of Dauphin Island and Gulf Shores in Alabama suffered massive damage, as did the urban areas of Mobile, Alabama, and Pascagoula, Mississippi, which were in the immediate area of landfall.[45]

Hurricane Frederic was monitored by increasingly sophisticated satellite tracking; the Mobile District's successes demonstrated the Corps' ability to respond to a major emergency. The periodic devastation of the U.S. mainland by tropical storms prompted the Federal government to commit resources and energy in investigating the dynamics of hurricanes and in tracking their movement (Map 10-4). Hurricane Frederic was picked up as a tropical disturbance off the west coast of Africa on 27 August 1979. Satellite photos the next morning revealed that the storm had intensified and was traveling westward in the northern part of the equatorial belt. Advisories were issued as the storm gathered strength over the next few days. On 1 September, Frederic was upgraded to a hurricane and appeared headed for the northern Caribbean.[46]

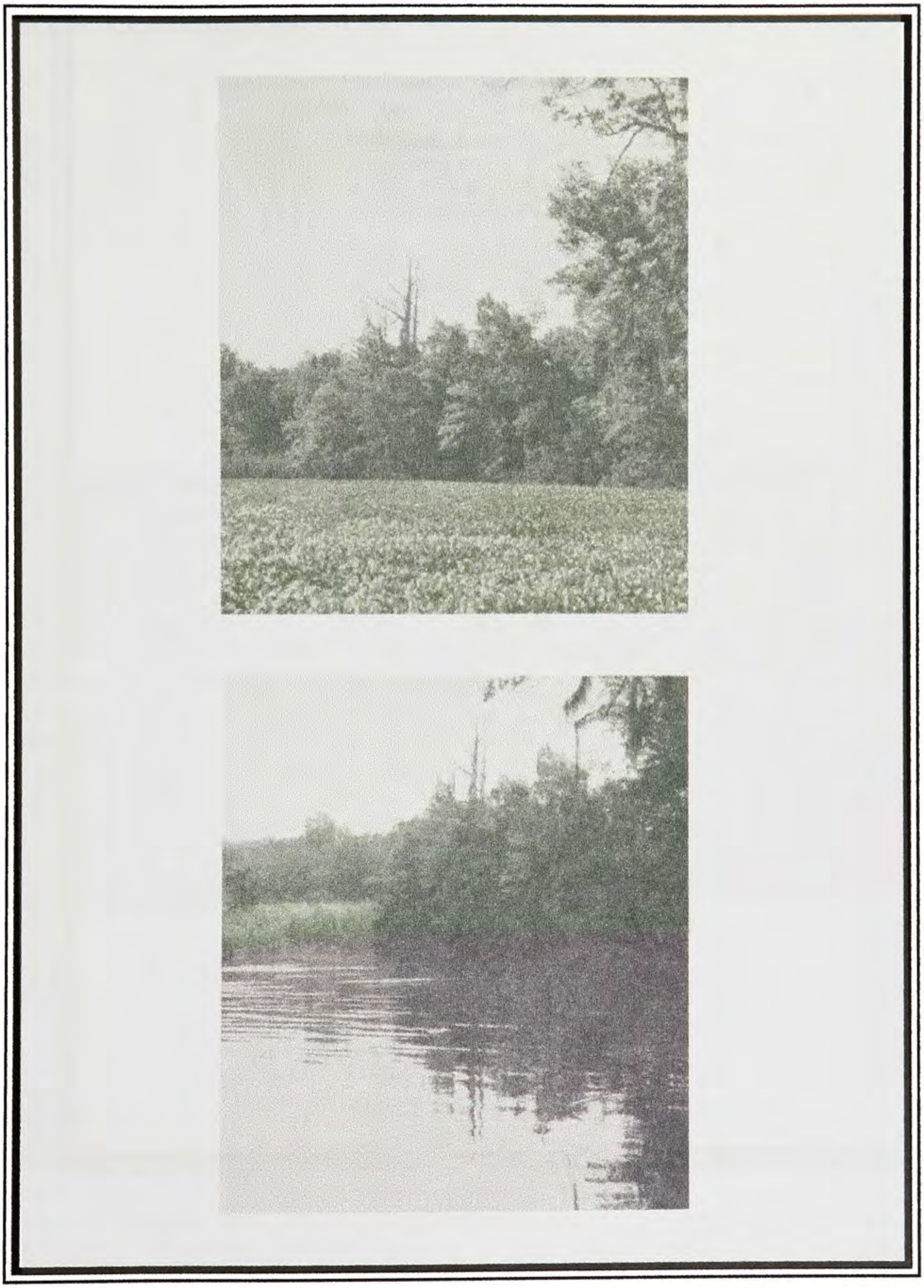
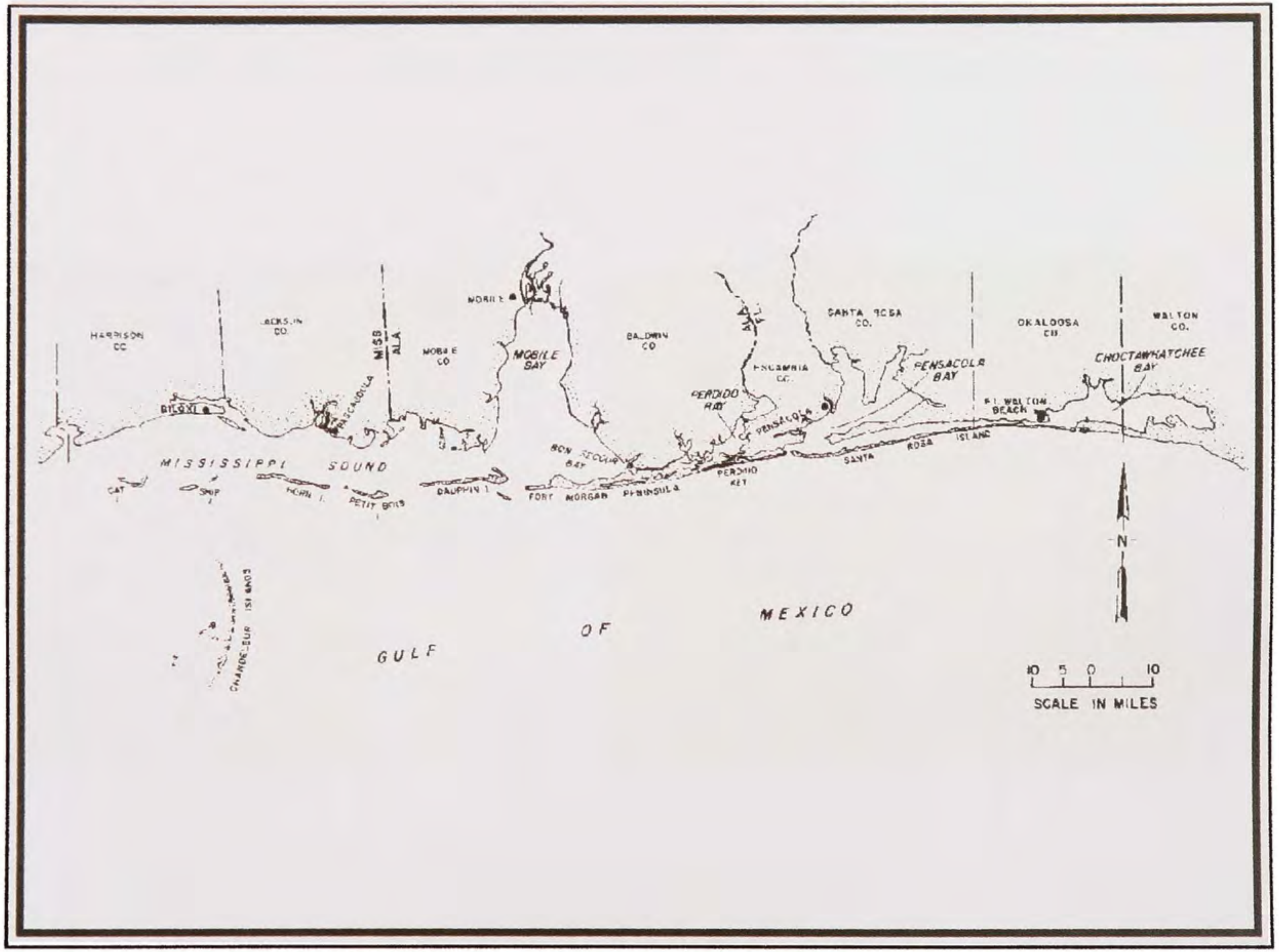
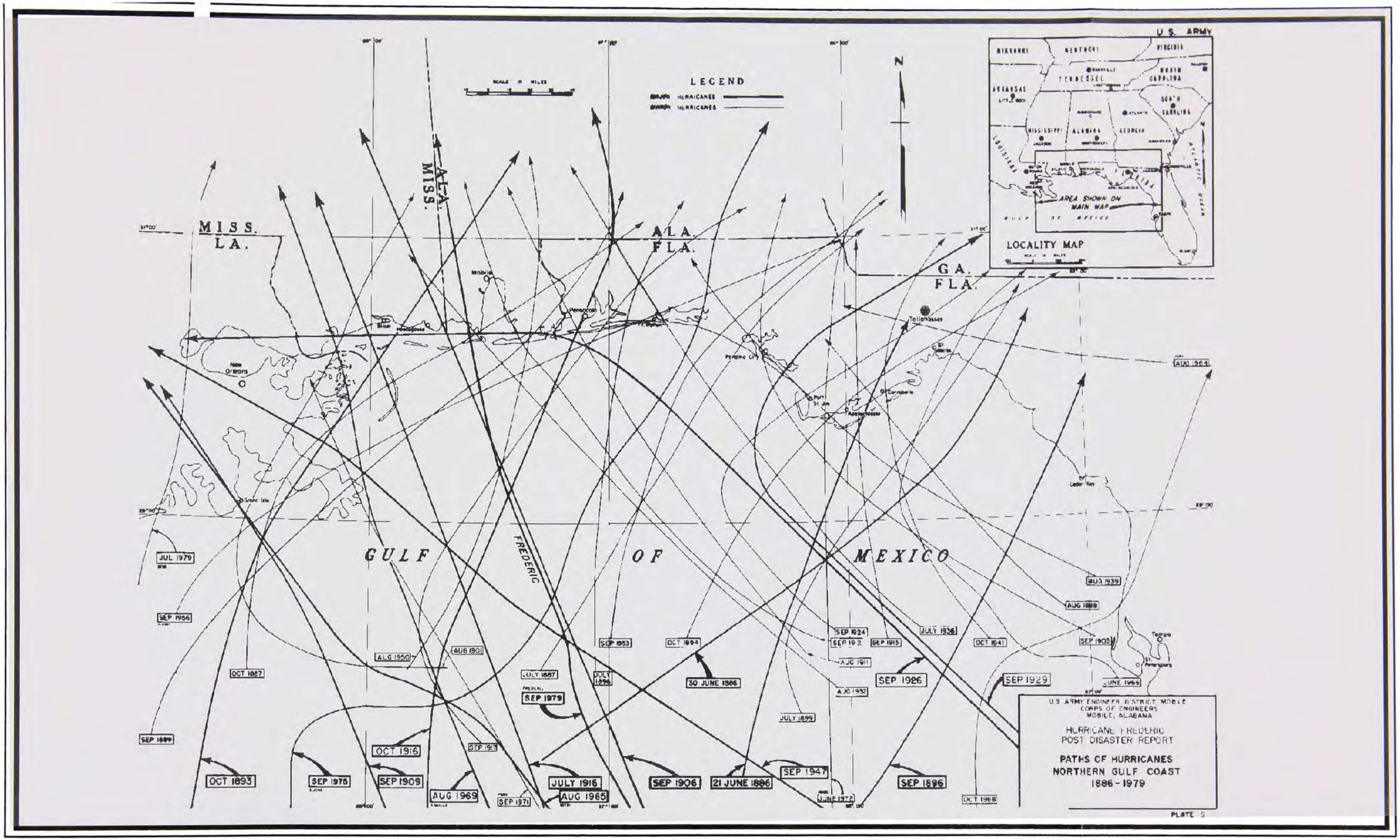


Figure 10-7. Aquatic plant control (*Water Resources Development in Alabama*), 1987, MDO; color added).



Map 10-3. Coastal areas affected by Hurricane Frederic 1979 (*Hurricane Frederic Report*, MDO).



Map 10-4. Hurricanes that affected the northern Gulf Coast, 1886-1979 (*Hurricane Frederic Report*, MDO).

As the storm approached the Greater Antilles, it began to diminish in intensity. Hurricane David, an intense storm system already in the Caribbean, was lashing Hispanola, and Frederic appeared to weaken as the two systems merged. Frederic was downgraded to a tropical storm and then a tropical depression, but was still causing heavy flood damage to Caribbean islands already saturated by the effects of David.

Between 6 and 9 September, Frederic continued as a tropical depression moving along the coast of Cuba in a northwesterly pattern. By 10 September the storm had moved away from Cuba into the Gulf of Mexico, and was intensifying. Reclassified as a hurricane, the storm then moved slowly toward the U.S. mainland. By 12 September, Hurricane Frederic had sustained winds of 130 mph around its eye and was located 275 miles southeast of New Orleans. Hurricane warnings were posted from Panama City, Florida, to Grand Isle, Louisiana. Preparations on shore were made for possible disaster. A storm surge of 10 to 15 feet above normal was expected when the storm eventually crossed the coast somewhere between Pensacola, Florida, and Gulfport, Mississippi.[47]

Evacuation procedures had already been implemented by 12 September and most of the coastal resorts, towns, and residential areas were nearly empty when the eye of the storm moved on shore around midnight on 12 September. Some meteorologists viewed Frederic's eye, which measured 50 miles east to west and 40 miles north to south, as the largest ever recorded. As the storm crossed the western end of Dauphin Island, winds were gusting above 130 mph; at Dauphin Island Bridge one gust was recorded at 145 mph.[48] The center of the storm struck the mainland near the Alabama-Mississippi border. By 2 am on 13 September the eye of the storm had passed just to the west of Mobile, with high winds causing extensive damage to the city.[49] The storm picked up speed as it moved inland and maintained hurricane strength until just after dawn; by this time the storm was as far inland as Meridian, Mississippi. Once again downgraded to a tropical depression, the storm shifted to the northeast and moved back into Alabama, near Tuscaloosa, before moving out of the state.

The governors of Alabama, Florida, and Mississippi requested that President Carter declare their states Federal disaster areas. President Carter responded on 14 September by declaring 30 counties in the three states eligible for disaster relief under P. L. 93-288 (22 May 1974).[50] Although early warning systems and evacuation procedures helped reduce loss of life, the storm did major environmental and property damage. Frederic was the most destructive storm ever to hit the Alabama coast (Figure 10-8).[51]

Advance warning capabilities indicated that the storm might make landfall near Mobile. Consequently, Governor Fob James, Civil Defense authorities, and Corps personnel urged residents to evacuate, particularly the coastal resort area around Gulf Shores. An estimated 150,000 people heeded the warnings and left the area.[52]

FEMA supervises and coordinates all disaster recovery operations and assigns responsibilities to various agencies. Under FEMA's authority, Mobile District personnel were dispatched immediately throughout the disaster area to begin assessing damage. In addition, the District assisted in debris removal in Mobile and Baldwin Counties, a process that lasted until June 1980.[53] During this period over 70,000 right-of-way applications were processed and over 10 million cubic yards of debris were removed at a cost exceeding $90 million.[54]

Other Mobile District responsibilities included providing generators, technical assistance, and support to local authorities. Hundreds of buildings had to be inspected for

Figure 10-8. An aerial view of damage from Hurricane Frederic on Dauphin Island, 1979 (Public Affairs, MDO).

structural damage, sunken vessels had to be removed, and dredging was necessary to keep the Dauphin Island Ferry in operation. The destruction of the bridge linking the mainland and Dauphin Island caused long-term isolation for island residents. Damaged buildings had to be demolished when they presented a hazard, and debris had to be cleared from streams and drainage outlets. The cost of all Corps operations in Alabama exceeded $97 million. Hurricanes wreak major environmental damage primarily because years of normal environmental change are compressed into a relatively short period of time. The Mobile District will be coping with coastal environment changes for years as a result of Frederic. The northward movement of beach sand and seawater caused the most extensive coastal damage. The primary dune system from Pensacola to Horn Island was flattened. Beach sands from Little Point Clear to Fort Morgan, and from the entire western half of Dauphin Island, were transported into Bon Secour Bay and Mississippi Sound, converting tidal salt marshes and meadows into open water and sand flats.[55]

Flora and fauna were disbursed as well. In addition to monitoring the environment and assisting the public in disaster recovery operations, the Mobile District also had to deal with recovery operations related to its primary construction responsibilities - navigation and multipurpose water resources projects and military facilities. Numerous military installations along the coast, especially the Air Force bases, sustained major damage that the Mobile District helped to restore. Keesler AFB in Biloxi sustained major damage as did the Naval Air Station at Pensacola.[56] Many roads, runways, seawalls, buildings, and beaches had to be repaired. Channel shoaling and sunken barges were a problem in several project areas; jetties at Panama City and at Perdido Pass also needed restoration. Most of the ports along the coast required extensive dredging on their outer bars to open their channels and to restore project depths.

The Corps plays an important role during crises by improving quality of life. The government was able to call on the Corps' manpower resources and expertise for the huge job involved in restoring normalcy to disaster areas. The Mobile District, in particular, lent significant manpower support to the restoration of basic community services like power and transportation.

Other Support

The Mobile District handles various other regulatory functions as well. Under P. L. 83-436 (28 June 1954), the Corps monitors flood control operations at a number of Alabama Power Company dams on rivers in the District. These include Lewis Smith Dam on Sipsey Fork (Black Warrior River) and Logan Martin, Weiss, and H. Neely Henry dams on the Coosa River.

As an outgrowth of interest in floodplain management, in the 1970s and 1980s the District participated in an extensive and ongoing program to collect and study data related to predicting and controlling floods and managing flood-prone areas. This is a service done at the request of various state and local agencies within the District.

Floodplain information reports dealing with flood hazards have been discontinued by the Corps because they overlap responsibilities now assigned to FEMA. FEMA produces Flood Insurance Studies that assess the degree of flood hazard for specific areas, delineate floodways and flood insurance zones and set rates for flood insurance charges. The Mobile District assists FEMA in producing these reports, and is reimbursed through the Department of Housing and Urban Development (HUD) as provided in the National Flood Insurance Act of 1968. The District also supports FEMA by providing data to municipalities for their use in establishing a regulatory program and in qualifying local residents for flood insurance.

In the early and mid-1970s, the Mobile District assisted such representative local agencies as the Atlanta Region Metropolitan Planning Commission, the Okaloosa Board of County Commissioners in Florida, the Atlanta Regional Commission, the Louisiana Department of Public Works, and the Birmingham Regional Planning Commission. By the early 1980s, Flood Insurance Studies were conducted for such areas as Picayune, Mississippi; Geneva, Wedowee, Oxford, and Weaver, Alabama; and Kennesaw and Powder Springs, Georgia. Fulton County, Georgia, and Montgomery County, Alabama, also received assistance. Special Flood Hazard Information Reports were accomplished for the Lower Chattahoochee Area Planning and Development Commission; the Cordele, Georgia, Housing Authority; the Coldwater Creek United Methodist Church in Coldwater Creek, Alabama; and the Gordon County, Georgia, Board of Commissioners.[57]

The most flexible part of the Flood Plain Management Services Program is the District's participation in a variety of technical services. The services include providing guidance in interpreting data found in flood insurance studies, delineating floodways, and assisting in preparing floodplain regulations. The Mobile District office also provides guidance on flood proofing and locating public buildings, subdivisions, and other land uses. If requested, the District can provide technical and engineering assistance in developing structural and nonstructural methods for preventing or reducing flood damage.

In recent years, the District has conducted emergency evacuation studies for local governments. The purpose of these studies is to develop a plan for emergency warning and evacuation for a specific location, including determining routes to designated temporary shelters and procedures for disaster recovery. The Tri-State Hurricane Evacuation Study that the District prepared for FEMA is an example of one such study.

The study covered ten coastal counties: Mobile and Baldwin in Alabama; Escambia, Santa Rosa, Okaloosa, Walton, and Bay counties in Florida; and Hancock, Harrison, and Jackson Counties in Mississippi. The study had five components:

- Hazard analysis - this analysis quantified surge heights and wind speeds that could be expected for various categories of hurricanes that might strike the coast. The Sea, Lake, and Overland Surge Heights (SLOSH) from Hurricanes is the latest numerical model developed for selected Gulf and Atlantic coastal basins.
- Vulnerability analysis - Taking results from the hazards analysis, this part of the study identified the areas and populations vulnerable to hurricane threats.
- Behavioral analysis - This part of the study determined public response to the threat of a hurricane. It looked at percentage of probable evacuation, use of public shelters, and destinations of evacuees.
- Shelter analysis - The shelter analysis provided an inventory of available public shelter facilities in the hazard zone, including their capacity and vulnerability; it also assessed additional need.
- Transportation analysis - All parts of the study were used to determine the time needed to evacuate an area. Sophisticated modeling was used to simulate hurricane evacuation traffic patterns to complete the analysis.

The service this study offered was demonstrated when the Gulf coast was hit by two hurricanes, Elena and Kate, in 1985. Local officials used the compiled data to evacuate the area and minimize the threat to human life.[58]

The Mobile District continues to have an important emergency operations function. The original authorization came about through the Office of Emergency Planning.[59] The Corps is authorized to cooperate with FEMA to assist state and local governments in time of disaster. The type of assistance has changed little over the years: protection of life and property; damage assessment; repair of public buildings, roads, and utilities; and a number of other technical and engineering services. The District also is engaged in flood-fighting and rescue operations, and in repairing and restoring any flood control work damaged by flooding (P. L. 84-99). This includes not only damaged reservoirs, but beach erosion caused by storms. Emergency water supplies also may be provided to drought-stricken areas or when the local water source is contaminated.

In 1978, an interagency agreement between the Environmental Protection Agency (EPA) and the Corps of Engineers gave the Mobile District substantial responsibility for inspection and construction management of the EPA-financed Construction Grant Program. The program provides for construction of sanitary sewage systems including treatment plants, interceptor and trunk sewers, and ocean outfalls.[60] The District is primarily responsible for construction oversight that involves monitoring the grants, reviewing plans and specifications, and working with bids on preconstruction contract awards. In coordination with the Alabama Department of Environmental Management, the District is responsible for periodic inspection of EPA-funded construction projects throughout Alabama. The Mobile District has regulatory authority to ensure that the highest engineering standards are met in constructing wastewater treatment projects and to ensure compliance with all Federal regulations intended to protect the environment.

The District also performed the Tennessee-Tombigbee Corridor Study. Begun in 1977, the study was the outgrowth of three congressional authorizations calling for the Corps to "provide a plan for development, conservation, and utilization of water and related land resources, giving consideration also to environmental quality and human and economic resources.[61] A 1972 House Public Works Commission resolution called for an assessment of the waterway's impact on Mobile and Baldwin Counties. In 1974, the House Committee on Public Works authorized an 18-county study; a 1978 resolution added 16 other counties. By the same action, the Chief of Engineers was given broad discretionary authority to add counties to the corridor study that he felt would be affected by the waterway's development. Since 1978 another 15 counties have been added for a total of 51 counties in the study matrix.

The corridor study was divided into four categories: the local economy; human resources; environmental quality of the region; and water resources available. Computerization techniques were used to facilitate compilation and systematic update of material, and to enhance its availability to the public. Two public access computer systems have been developed to deliver data including the Economic Impact Assessment Model (EIAM), which computes and analyzes socioeconomic data, and the Integrated Data Analysis System (IDAS), which is a geographic information system with the capacity to produce high-quality visual data for display and analysis.

Both computer systems are designed to assist the public in determining the beneficial impact of development in the corridor. Local planners and officials can use the systems to simulate development in their segments of the corridor and to study the potential effects. This service is available to 33 official users at planning offices, universities, and agencies in the 51-county area.

A New Direction for the Mobile District: The Environmental Era, 1815-1861: Notes

1 Lt. Gen. F.J. Clarke, "The Chief of Engineers' Environmental Advisory Board after Two Years: Redirection for the Corps," *Water Spectrum*, Volume 4, No. 3 (Fall 1972): 2. Clarke responded in this article from the recipient's perspective. The other part of the article represents the perspective of the Advisory Board's chairman, Roland C. Clement. Hereafter cited as Clarke or Clement, "Redirection for the Corps."

2 Ibid.

3 Martin Reuss, *Shaping Environmental Awareness: The United States Army Corps of Engineers Environmental Advisory Board, 1970-1980* (Washington, DC: Historical Division, Office of the Chief of Engineers, n.d.), p. 1. Hereafter cited as *Environmental Awareness*.

4 Ibid.

5 Charles D. Ablard and Brian Boru O'Neill, "Wetland Protection and Section 404 of the Federal Water Pollution Control Act Amendments of 1972: A Corps of Engineers Renaissance," *Vermont Law Review*, 1, No. 51 (1976): 55. Hereafter cited as "Wetland Protection and Section 404."

6 Ablard and O'Neill, "Wetland Protection and Section 404," p.56.

7 John Lear, "Environment Repair: The U.S. Army Engineers' New Assignment," *Saturday Review*, 54, (1 May, 1971): 49. Hereafter cited as "Environment Repair."

8 Arthur Maass, *Muddy Waters: The Army Engineers and the Nation's Rivers* (Cambridge, MS: Harvard University Press, 1951).

9 Ablard and O'Neill, "Wetland Protection and Section 404," p.58. Other acts passed that affected the Corps permit procedure include the National Historic Preservation Act of 1966; the Water Quality Improvement Act of 1970; the Marine Protection, Research and Sanctuaries Act of 1972; the Coastal Zone Management Act of 1972; the Endangered Species Act of 1973; and various amendments to the above. All of these acts were intended to improve the Corps' responsiveness to public concern about protection to the environment, and to provide a mechanism for public involvement in the decision-making process.

10 Lear, "Environment Repair," p.49.

11 Ibid., p.50.

12 Ibid.

13 Garrett Power, "The Fox in the Chicken Coop: The Regulatory Program of the U.S. Army Corps of Engineers," *Virginia Law Review*, 63, No. 4 (May 1977): 513.

14 Garrett Power, "The Fox in the Chicken Coop: The Regulatory Program of the U.S. Army Corps of Engineers," *Virginia Law Review*, 63, No. 4 (May 1977): 513.

15 William F. Schneider, "Federal Control Over Wetland Areas: The Corps of Engineers Expands Its Jurisdiction," (Commentary) *University of Florida Law Review*, 28, No. 3 (Spring 1976): 788 note. See also William H. Rodgers, Jr., *Handbook on Environmental Law*, Hornbook Series (St. Paul, MN: West Publishing Company, 1977), p.356.

16 Clarke, "Redirection for the Corps," p.2. Reuss, *Environmental Awareness*, p.11.

17 "Wetland Protection and Section 404," p. 59.

18 "The Fox in the Chicken Coop," p. 522.

19 Elinor Lander Horowitz, *Our Nation's Wetlands: An Interagency Task Force Report, Coordinated by the Council on Environmental Quality* (Washington, DC: GPO, 1978), p. 52.

20 Rodgers, *Environmental Law*, p. 401.

21 Ibid.

22 Ibid., p. 403.

23 Ibid.

24 Clement, "Redirection for the Corps," p.3. See also, Power, "The Fox in the Chicken Coop," p.559. Power concludes that "Once the nemesis of the environmentalists, the Corps is now their hero." According to a quote from Senator Edward Muskie: "[We] have put the fox in the chicken coop [and it has] become a chicken."

25 "The Fox in the Chicken Coop," p.551.

26 U.S., Congress, Senate, Committee on Environment and Public Works, Oversight *Hearings on Section 404 of the Clean Water Act, Part 2*, 99th Cong., 2d sess., S. Hrg. 99-278, pt. 2, 31 July, 1986. See also U.S., Congress, Senate, *The Clean Water Act Showing Changes Made by the 1977* Amendments. 95th Cong., 1st session, S. Rpt. 95-12 December, 1977.

27 The decision to shift regulatory authority from the Mobile District to other Districts is an internal decision made at the Division level to distribute workload more evenly. Reassigning workloads among Districts enables the Corps to maximize efficiency of operations. Adjoining Districts with lighter workloads can assist neighboring Districts on an as needed basis. In the case of 404 regulations, the decision was made at the Division level to streamline the permit process by making each District responsible for all territory within a state, regardless of District boundaries. Consequently, projects in the Florida panhandle, even though within the Mobile District, would be handled by the Jacksonville District. Likewise, the Savannah and Vicksburg Districts handled their respective states' portions of the Mobile District's territory. This arrangement has achieved an equitable distribution of the regulatory workload without overtaxing the energy of a single District. This information was confirmed in a telephone conversation with F. L. ("Les") Curry, Executive Assistant, Mobile District Office, 29 September 1988.

28 Holmes, Misc. Pub. No. 1379, 1979, p.115. The Corps is working on initiatives to significantly reduce the average project timetable.

29 John A. Ferejohn, Pork *Barrel Politics: Rivers and Harbors Legislation, 1947-1968* (Stanford, CA: Stanford University Press, 1974), pp.22, 74.

30 *ARCE, 1971*, p. 10-5.

31 U.S., Army Corps of Engineers, *Water Resources Development in Alabama 1987* (Mobile, Al: U.S. Army Engineer District, 1987), p. 19. Hereafter cited as *Water Resources Development in Alabama 1987*.

32 The history of the Tenn-Tom is the subject of a separate manuscript prepared for the Mobile District by Dr. James Kitchens. Kitchen's manuscript is as yet unpublished. A second volume was prepared by Jeffrey K. Stine to complete the waterway's history. The Tenn-Tom has created so much negative press that it difficult to produce useful bibliographic entries; most public documents are critical of the Corps' involvement in this project. A less vitriolic source that contains worthwhile information on the political aspects of the waterway's development is William H. Stewart, Jr., *The Tennessee-Tombigbee Waterway: A Case Study in the Politics of Water Transportation* (University, AL: University of Alabama Bureau of Public Administration, 1971). Chapter IV, "The Conduct of the Corps of Engineers," relates to Tenn-Tom.

33 *ARCE, 1980*, Volume II, pp. 10-15.

34 *Water Resources Development in Alabama 1987*, p. 25.

35 Ibid., p.27.

36 Thousands of pages of information have been published as a result of the cultural resources management program. The following citations represent the range and quality of research accomplished in the corridor as partial fulfillment of the District's responsibility toward Federal mandates. See, David C. Weaver and James F. Doster, *Historical Geography of the Upper Tombigbee Valley* (and its companion volume *Historic Settlement in the Upper Tombigbee Valley*), Contract C-5714 (78) (Washington, DC: National Park Service, 1982); Michael J. Hambacher, 22 Lo 741: *A Nineteenth Century Multipurpose Light Industrial Site in Lowndes County, Mississippi*, Contract CX4000-3-0005 (Washington, DC: National Park Service, 1983); Eugene M. Wilson, *An Analysis of Rural Buildings in the Tombigbee River Multi-Resource District* (Washington, DC: National Park Service, 1983); W. Lee Minnerly, ed., *Oral Historical, Documentary, and Archaeological Investigations of Barton and Vinton, Mississippi: An Interim Report on Phase II of the Tombigbee Historic Townsites Project*, Contract CX4000-3-0005 (Washington, DC: National Park Service, 1983); William Hampton Adams, ed., *Waverly Plantation: Ethnoarchaeology of a Tenant Farming Community*, Contract C-55026 (79) (Mobile, AL: U.S. Army Engineer District, 1980); and Robert C. Sonderman, et. al., *Archaeological Survey and Testing of Vienna Public Access Area Tennessee-Tombigbee Waterway*, Contract DACW01-81-MM-9018 (Mobile, AL: U.S. Army Engineer District, 1982.)

37 The projects in the upper Flint River basin were deauthorized in the Water Resources Development Act of 1986.

38 U.S., Army, Corps of Engineers *Water Resources Development in Georgia 1987*, (Savannah, GA: U.S. Army Engineer District, 1987), p. 30. Hereafter cited as Water *Resources Development in Georgia 1987*.

39 A tainter gate is a semicircular gate that opens and closes by pivoting on a shaft and is used to control the flow of water over spillways.

40 Information taken from preface to Design Memorandum 37, West Point Project, Master Plan. Material provided by the Mobile District Office.

41 *Water Resources Development in Georgia 1987*, p. 22.

42 U.S. Army Engineer District, Galveston, TX. Brochure "Your Gulf Intracoastal Waterway," no date.

43 *Water Resources Development in Alabama 1987*, p. 83.

44 U.S. Army Engineer District, Mobile, *Hurricane Frederic, Post Disaster Report, 30 August - 14 September 1979*, February 1981, p. 3.

45 Ibid., pp. 7-8.

46 Ibid., p. 11.

47 Ibid.

48 Ibid., p.71. Frederic, rated as a high category 3 storm on the Saffir/Simpson Hurricane Scale, was the first major hurricane with a masculine name to strike the United States. The Saffir/Simpson Hurricane Scale rates the intensity of hurricanes on a scale of 1 to 5 with 5 being the most intense. The U.S. government initiated the practice of alternating masculine and feminine names for hurricanes in 1979.

49 Ibid., p. 21.

50 Ibid. p. 76.

51 Ibid., p. 209.

52 Ibid., p. 226.

53 Ibid.

54 Ibid. p. 246.

55 Ibid., pp. 151-159.

56 Representative examples of studies completed are taken from tables provided in the Mobile District's annual report to the Chief of Engineers.

57 Information on the Tri-State Hurricane Evacuation Study is summarized in *Water Resources Development in Alabama 1987*, p. 40.

58 The Office of Emergency Preparedness (OEP) evolved into the Federal Emergency Management Agency (FEMA) which was established in the executive branch as an independent agency in 1978.

59 Ibid., p. 87.

60 Ibid., p. 39.

Part 4 – The Military Mission, 1870-1985

XI. Seacoast Defenses, 1870-1920

The Corps' military responsibilities were in flux during the decades following the Civil War, when congressional appropriations for repair and upgrade of seacoast fortifications dropped sharply. Public interest shifted rapidly to economic revitalization. A national trend was established after the Civil War, and remained unchanged until after World War II, in which public support for military ventures dissipated soon after peace was negotiated. Congress was pressured to fund internal improvements rather than military preparedness. From a military point of view, failure to provide even minimal funding to maintain the general defense meant that the United States was inadequately prepared for the onset of both the Spanish-American War and World War I, and to a certain extent even World War II.

Nevertheless, additions were made to some of the old seacoast fortifications that survived the Civil War. Pensacola had the most elaborate defense systems; operations at Mobile Bay were much less significant, poorly organized, and chronically underfunded.[1] The last quarter of the nineteenth century and the first few decades of the twentieth saw dramatic technological advances in ordnance. In many ways, the revitalization of the seacoast defenses, although limited, is a history of the evolution of ordnance.[2]

The changes in ordnance technology were accompanied by advances in shipbuilding technology also. Steam-powered ships became the norm following the Civil War. The advent of steam power permitted flexibility of design and revolutionized the maneuverability of naval vessels. The new ships also had more iron armor. This greater maneuverability, speed, and protection made them less vulnerable to firepower from seacoast forts but more likely to come into conflict with shore batteries. Ship ordnance was improved as well and firepower was increased so that ships could now successfully attack masonry forts.[3]

Advances in weaponry were so rapid following the Civil War that the seacoast forts, although the best in the world in terms of design, construction quality, and armament, became obsolete within a few years. The increased firepower from ships, and their improved invincibility, threatened the old forts. The use during the war of crude rifled cannon, based on the design of former Army ordnance officer Robert B. Parrot, demonstrated that these new cannon could quickly reduce vertical walls to rubble.[4] Changes in seacoast defense clearly were needed.

In 1865, the Chief of Engineers ordered the Board of Engineers to investigate the seacoast fortification system. The board was to submit suggestions for necessary modifications in light of the Civil War experience and based on aggressive foreign ordnance research. In addition, the Engineer officers were instructed to consider the advisability of wrought-iron armor in lieu of masonry siding for forts, and whether new armaments should be mounted on carriages that would allow the cannon to slide down behind the parapet when not in use. Several European nations were already experimenting with the use of wrought-iron armor for their forts; wrought iron continued to be important in military architecture into the twentieth century.[5]

The board issued a long report with a number of recommendations, to include the following:

- The seacoast defenses should consist of powerful batteries with the largest guns possible.
- All batteries should use the disappearing gun carriage.

- Mortar batteries should be used as a means of firing at decks of vessels (their weakest point).
- Torpedoes (mines) and obstructions should be employed to defend harbor channels wherever possible.
- Granite casemates were no longer suitable for batteries.
- If at all possible armor plate should be used instead of granite for the front of casemates, or where granite had been found unacceptable.[6]

By the time the report concluded, national economic conditions and political priorities had rendered appropriations for military construction negligible.

At the same time, Army Engineers were reluctant from the onset of the post-Civil War fortification assessment to construct another system that might obsolesce as rapidly as its predecessor, the so-called Third System. As confirmed in the later Endicott Board report, some foresighted Engineer officers anticipated even greater advancement in artillery than was evident in the technological changes taking place in European and American ordnance.[7]

One result of the 1865 Board of Engineers' report was a conclusion that the larger guns necessary to upgrade the coastal defenses could not be placed effectively in the old masonry forts; separate batteries would need to be constructed. For the first time since the Revolutionary War, strategic placement of batteries would constitute the central focus of defense. The concept of earthen batteries was also appealing. The batteries would be fairly inexpensive to construct and were therefore a viable alternative to prohibitively expensive iron-clad fortifications.

An ambitious but short-lived program of construction was initiated in the 1870s.[8] The Atlantic and Gulf coast forts were badly in need of repair and upgrading, and batteries were built at some of these. The new earthen batteries were constructed outside of the old masonry forts, with guns mounted *en barbette*; guns mounted on disappearing carriages were used rarely at the time.[9]

By 1875 Congress had virtually ceased funding new military construction or maintenance of the existing fortification system. Consequently, the system fell into gross disrepair, a condition that remained unchanged for nearly 15 years. Despite the lack of improvements or upkeep, and dated ordnance, the Third System forts continued to serve as the major line of seacoast defense.

These setbacks notwithstanding, the period of decline was a turning point in fortification design. No future major fort would be constructed as a single unit with large numbers of guns. Instead, the basic design became one of strategically located and dispersed batteries on a site chosen for tactical advantage. Although funds were not available for construction until the late nineteenth century, ordnance research and development continued. By the 1890s seacoast armament had been revolutionized by developments in the use of steel, advances in breech-loading, and the manufacture of better propellants.[10]

Endicott and Taft Boards

On 3 March 1885 Congress authorized the formation of a joint Army-Navy-civilian board to investigate the seacoast fortification system and to make defense recommendations based on improved weaponry technology. President Cleveland appointed the Secretary of War, William C. Endicott, to head the committee, which became known as the Endicott Board. Early in 1886 the board recommended construction of a vast new system of forts armed with huge guns. The system would be complemented by floating batteries, torpedo boats, and submarine mines.

The suggested project was ambitious, and not very realistic considering the recent history of funding for military construction. Nonetheless, in 1890 Congress acted on the recommendations of the Endicott Board by appropriating $1.2 million for seacoast fortification construction, the first such appropriation in 16 years.[11] The board's original recommendations on the caliber of weapons needed were rapidly outdated because of ongoing ordnance research and development; however, liberal allowances for improved technology were incorporated in the report. The foresight of the officers and civilians who drafted the report enabled it to serve as the basis for annual requests to Congress for funding into the twentieth century. The program begun, in the 1890s, saw the construction of dispersed batteries. Where possible, these batteries were located seaward of the old masonry forts; otherwise, new batteries were constructed within or on top of the old forts. Such a solution to space problems was evident in the Gulf and Atlantic coast forts (i.e., Forts Gaines and Morgan in the Mobile District). For the most part, however, new batteries were located next to and outside of old works.[12]

In 1905, President Theodore Roosevelt created a new board under the leadership of Secretary of War Howard Taft. This board, which became known as the Taft Board, was to update the Endicott Board report. Aside from examining advances in armaments technology, the new board was interested in making recommendations for fortifications in foreign territories gained by the United States in the Spanish-American War. Principal defense locations in these new territories were at the entrances to the Panama Canal, Pearl Harbor in Hawaii, and Manila and Subic Bays in the Philippines.

The Taft Board report also dealt with accessory defense needs for harbors: including railroad connections, searchlights for night-time illumination, and general electrification for all harbor operations. An important part of the board's assessment dealt with a modern system for aiming large-caliber guns, considered to be the most modern advance in harbor defense until the introduction of radar in World War II.[13] The new system of precision aiming also offset advances in naval firepower because the latter had to operate from a moving base with inherently poor aiming-calculation ability. As a result, for a brief period at the beginning of the twentieth century, shore batteries had a greater range than those on ships.[14]

Mobile Bay

The Endicott Board made recommendations for the improvement of seacoast fortifications. Mobile Bay was 14th on a list of 27 principal ports where improvements were needed critically.[15] In addition, the Endicott Board recommended the creation of five batteries of various sizes at Fort Morgan (Figure 11-1). Battery Bowyer was the first battery constructed and was completed by 1899 (Figure 11-2). The battery was an emplacement for four 8-inch guns on disappearing carriages.

The second battery constructed was a concrete emplacement built in 1898 and named Battery Duportail. This emplacement was constructed across the interior of Fort Morgan and armed with two 12-inch breech-loading guns on disappearing carriages. The concrete emplacement cut the fort nearly in half (Figure 11-3) and when completed was cushioned by filling in the back part of the fort with sand. Sand absorbed some of the shock from firing the guns and added a measure of protection.[16] The 53-ton rifles, which fired 1,000-pound projectiles, could control sea lanes up to ten miles from the coast, although the effective range was seven to eight miles.[17] The guns used at Battery Duportail were typical of the Endicott era and were flat-trajectory weapons with a limited angle of elevation of approximately 15 degrees. Such an angle, however, provided the necessary range to outshoot or at least match the guns of contemporary warships.[18]

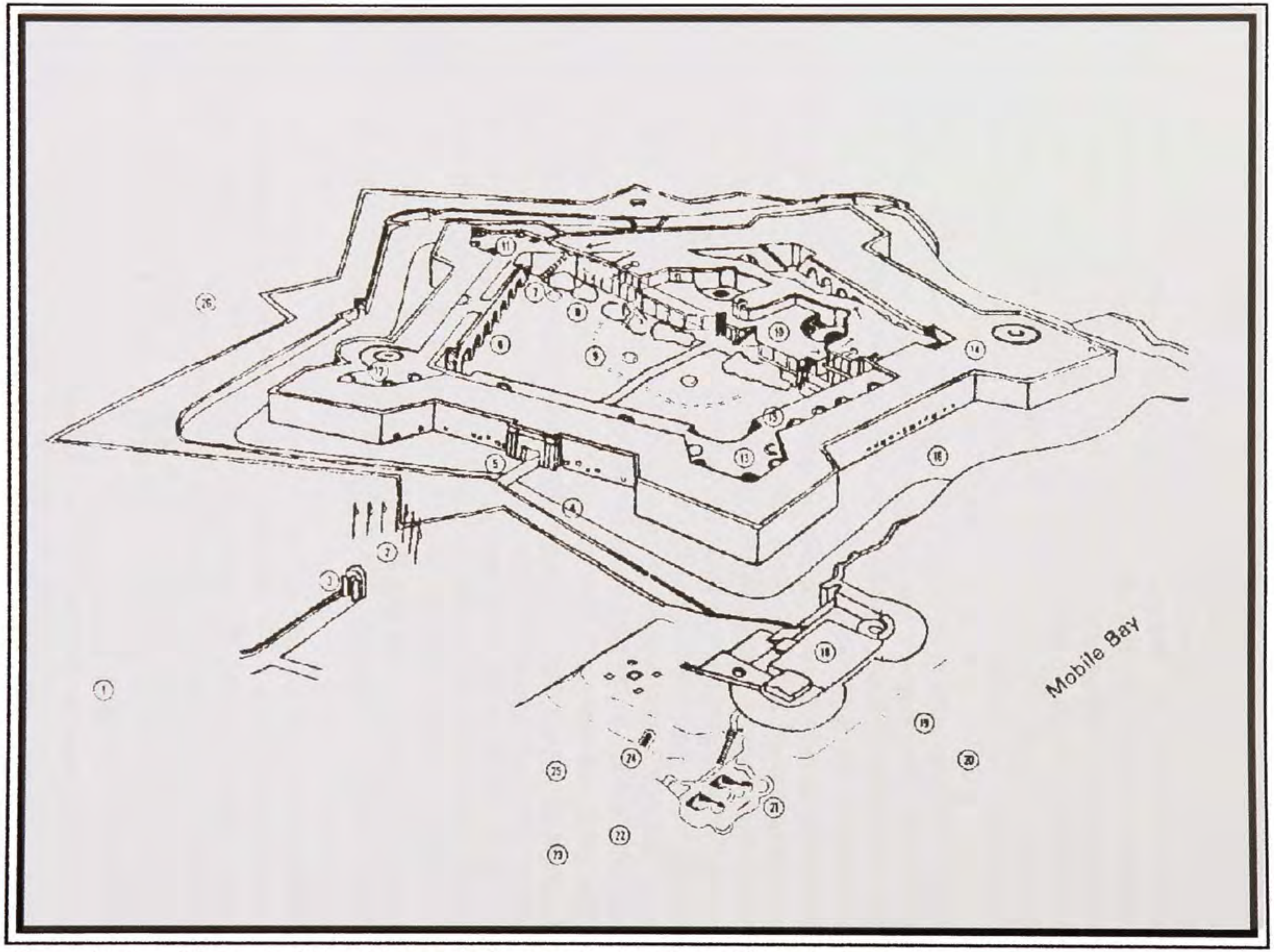


Figure 11-1. Diagram of Fort Morgan indicating the location of batteries immediately adacent to the fort (Alabama Historical Commission).

Figure 11-2. An aerial view of the Fort Morgan Reservation in 1929, looking south (Public Affairs, MDO).

Figure 11-3. Photograph of Fort Morgan showing Batteries Thomas and Schenk (Public Affairs, MDO).

Battery Thomas was built in 1900 to mount two 4.7-inch British Armstrong rapid-fire guns (Figure 11-3). This battery was intended to protect the entrance to the bay and is connected via a tunnel to a powder magazine constructed as part of maintenance in the 1870s.

Construction on Battery Dearborn began in 1899. It was located well to the east of the other batteries constructed on the reservation and was armed with eight 12-inch mortars. Such mortars, usually installed in groups of 8 or 16, used 700-pound shells that would be fired simultaneously. The projectiles acted like shotgun pellets; they were fired in high arcs to descend vertically onto the unprotected decks of enemy ships.[19]

Another type of armament was placed at Fort Morgan in the ordnance mounted in Battery Schenk, a small emplacement adjacent to Battery Thomas that was used primarily to protect the underwater mines placed at the bay entrance. The armament consisted of three 3-inch rapid-fire pieces that were easy to maneuver. This category of rifle was light, mounted on pedestal carriages, and possessed metal shields.

During the Endicott-Taft period, construction was accomplished on other necessary harbor defenses and support buildings for the troops stationed at the fort. The Taft Board spurred a number of changes. Although the Taft Board was to review the Endicott Board's efforts and make further recommendations, the Taft Board report focused on fortification accessories. In addition to recommendations for illumination and general electrification of all defense activities, the report stressed developing a modern system to improve accuracy of the new large-caliber guns and mortars.[20]

The new aiming system was probably the board's most significant proposal. Until that time, ships could not aim accurately because readings had to be taken while in motion. Shore batteries, on the other hand, could take precise readings, rapidly compute the necessary calculations, and then use telecommunication to transmit them to the gun emplacements. Pending advances in naval technology, shore batteries had the most accurate firepower than in any other period.[21]

Other minor constructions at Fort Morgan during the period included support structures for troops stationed at the site, and new wharf facilities to transport supplies and materials (Figure 11-4). Some similar structures were built across the bay at Fort Gaines, but the fort never figured significantly in the defense of Mobile Bay.

Plans for improvements at Fort Gaines were not finalized until 1901; they called for two batteries of two 6-inch guns each. The batteries were constructed, but the ordnance was never mounted.[22] The Chief of Engineers did approve plans for additional emplacements (which had been suggested by the Endicott Board), but none were built. By 1902 the Spanish-American War posed no threat to the American mainland, and appropriations for military construction were reduced accordingly.

Pensacola Bay

Pensacola was the principal focus of fortification improvement after the Civil War. The regional naval station was there, and Fort Pickens was in better condition than other masonry forts along the Gulf. Nevertheless, the rate of improvement to Fort Pickens differed little from that at Fort Morgan until the end of the nineteenth century. While the Endicott Board recognized Pensacola's significance for defense, appropriations were still slow in coming.

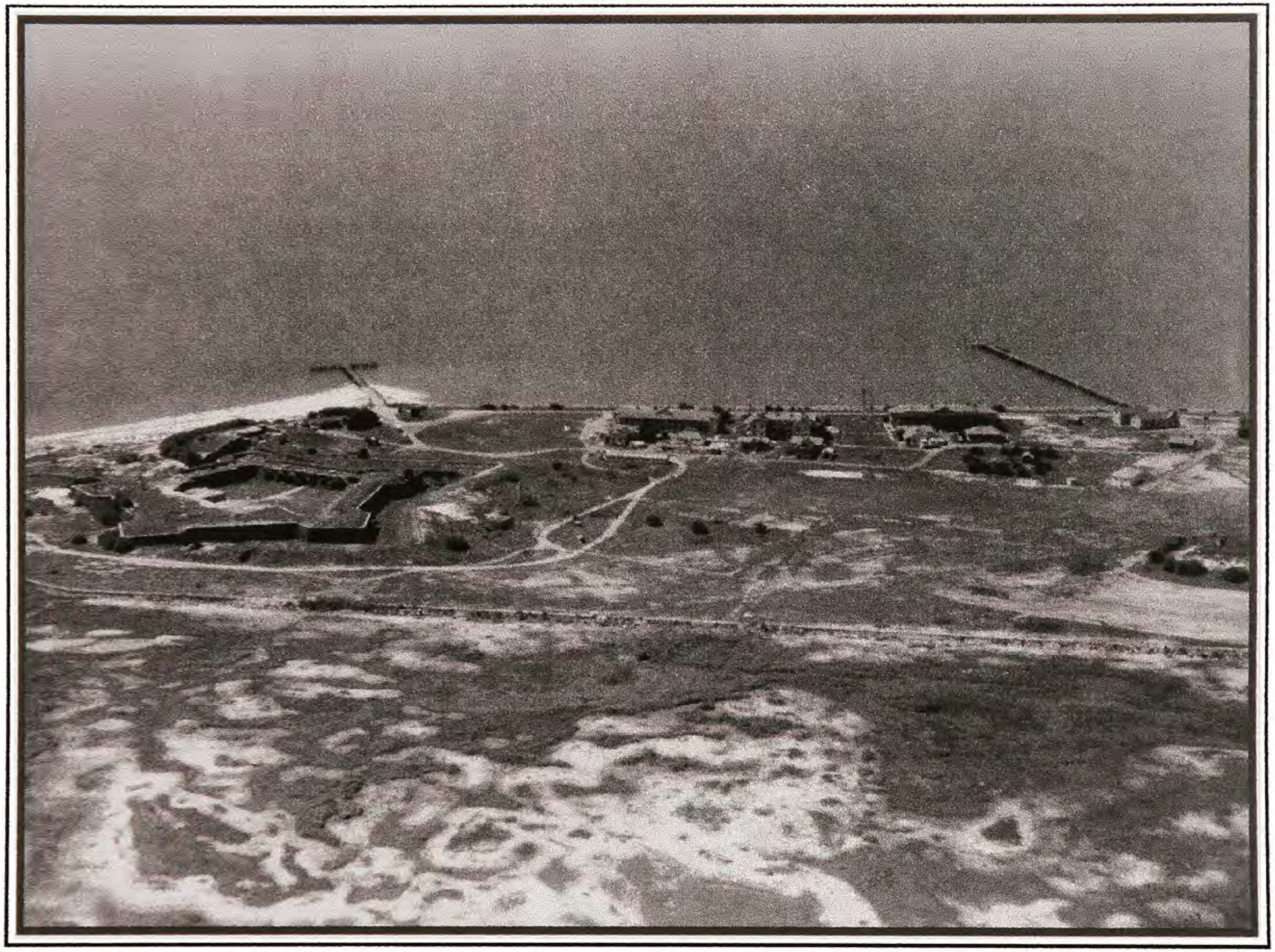


Figure 11-4. Photograph of Fort Morgan showing the fort, batteries, support structures, and wharves, circa 1933 (Public Affairs, MDO).

By the end of the century two 15-inch Rodman guns were mounted in the Water Battery, just below Fort Barrancas, to be used for training purposes. Three 8-inch Rodman rifles placed inside the fort also were suitable for training. Eventually, a new generation of ordnance was placed at the entrance to Pensacola Harbor. New ordnance at Fort Pickens and on Foster's Bank made Fort Barrancas obsolete and its guns fell silent.[23]

In 1901, the Coast Artillery was created, a branch of the Army whose officers were to be specialists in heavy ordnance, fire control, and night-time harbor illumination. Fort Barrancas became a Coast Artillery post and headquarters for the Pensacola coastal defenses. Until 1947 the fort served as one of the more important Coast Artillery posts, handling scores of military recruits sent to learn about the defense system's new weaponry.[24]

Fort Pickens was better known to the general public of the late nineteenth century as a temporary prison than as a defense post. In 1886 the fort was used to house Apache Indians, including Chief Geronimo. Eventually, wives and children of the Indian captives were allowed to live at the prison and for nearly two years the Indians served as a tourist attraction. In 1888 the Indians were removed to Alabama.[25]

The Endicott Board recommended submarine mines and floating booms for harbor defense; the entrance to Pensacola Bay was to be defended by rapid-fire guns sited on Santa Rosa Island. During the Spanish-American War, submarine mines were planted in the bay and searchlights were mounted for sweeping the channel at night.[26]

Twelve different batteries were constructed and armed at Fort Pickens during the Endicott and Taft period (Map 11-1). The first constructed was Battery Cullum (1898), which had four 10-inch guns placed on disappearing carriages.[27] In 1916 emplacements No. 1 and No. 2 at Battery Cullum were renamed Battery Sevier. Emplacements No. 3 and No. 4 continued as Battery Cullum. Battery Worth also was completed at the end of 1898; it was armed in mid-1899 with eight 12-inch mortars.[28]

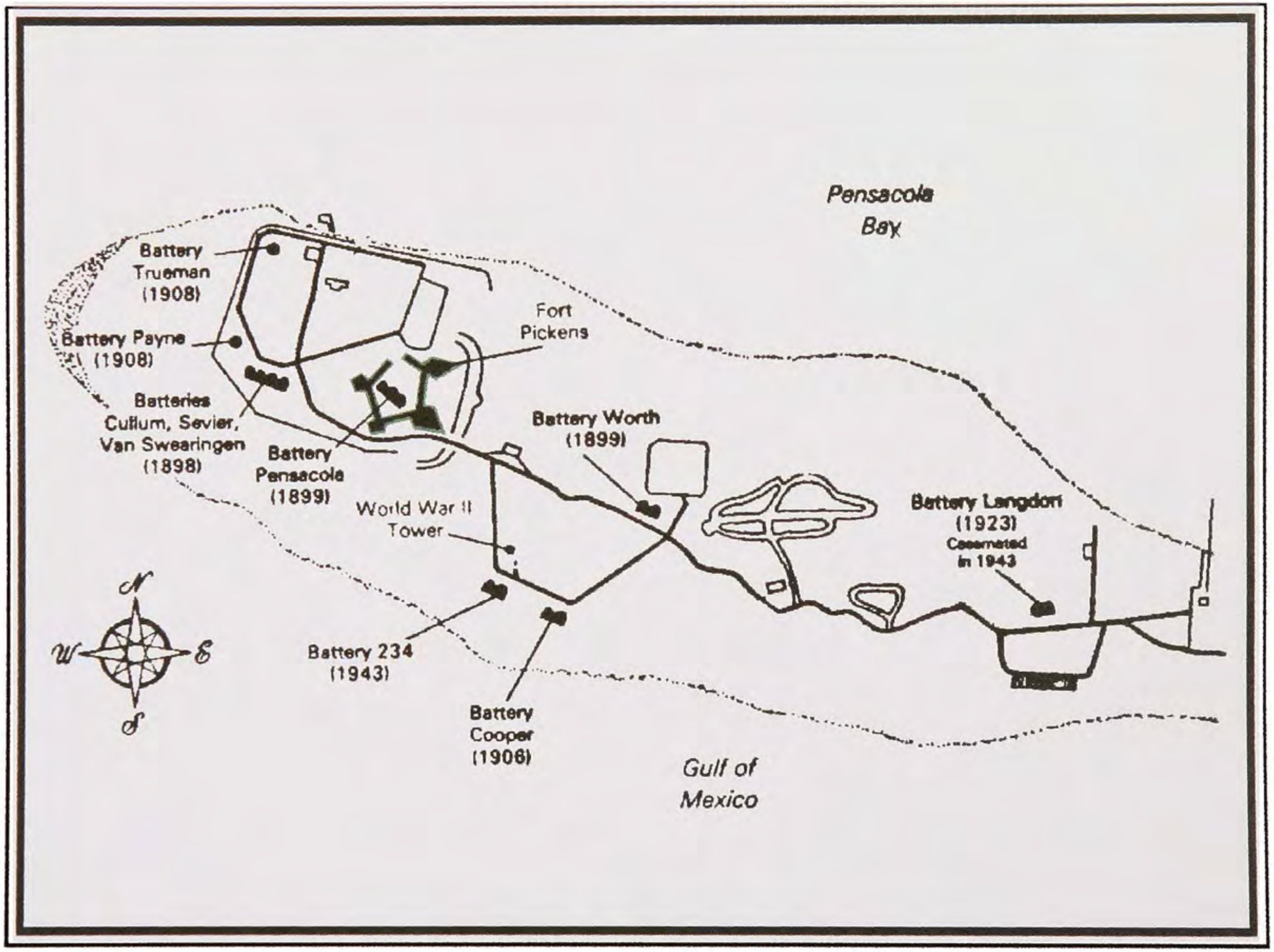
Battery Van Swearingen, authorized in March 1898, was to have two 4.7-inch Nordenfeldt rapid-fire guns mounted adjacent to the 10-inch guns already in place at Battery Cullum. Within a few months the two guns arrived, the emplacements were completed, and the ordnance was mounted.[29] A fourth battery was under construction in the remnants of Fort Pickens. Battery Pensacola was completed in June 1899 and armed with two 12-inch breech-loading rifles on disappearing carriages.

Battery Slemmer was authorized and constructed on Foster's Bank and other batteries were approved and constructed as well in selected sites on the military reservation on Santa Rosa Island. During the Endicott period Batteries Cullum, Worth, Slemmer, Pensacola, Van Swearingen, Trueman, Payne, Cooper, and Center were constructed and armed. During the Taft period, Batteries Langdon, Sevier, and Fixed (AA) were completed. Searchlights also were installed.[30]

World War I

When the United States entered World War I, it was poorly prepared for the demands that would be placed on its construction capability. The nation was forced to embark on an aggressive military construction campaign.

During World War I, the various Engineer Districts had no specific responsibilities for planning and constructing military facilities within their territorial boundaries. Military construction in the Mobile and Montgomery Districts, as elsewhere, was handled by the Construction Division of the Army. The Division grew out of the Cantonment Division,



Map 11-1. Fort Pickens and surrounding batteries on the western tip of Santa Rosa Island (Gulf Islands National Seashore).

which was responsible for emergency construction undertaken by the War Department in 1917.[31] The Quartermaster General's office was the overseeing agency. However, the responsibility for military construction would shift to the Corps of Engineers following a protracted and often bitter political debate.[32]

The District's various construction sites were widely dispersed. Although the nation had capitalized on the climatological advantages of placing military establishments in the South during this period, construction was of necessity so rapid that sites tended to be large and relatively few in number. The original plan called for the construction of 16 cantonments; it soon became clear that training camps were needed as well. A decision was made to construct 32 camps with a capacity of 40,000 men each. The total construction program was later reduced to 16 cantonments and 16 training camps.[33]

The nation was divided into northern and southern zones to facilitate completion of the program. Of the 36 projects ultimately approved, 22 were located in the southeastern quadrant of the United States (Map 11-2). Four types of units were included in the program:

- Cantonments - Composed of wooden or other buildings used to house troops
- Camps - Collections of tents used for the same purpose as cantonments
- Billeting - Assignment of troops to public buildings and private homes for shelter during training
- Bivouac - Areas for field exercises; devoid of shelters of any kind

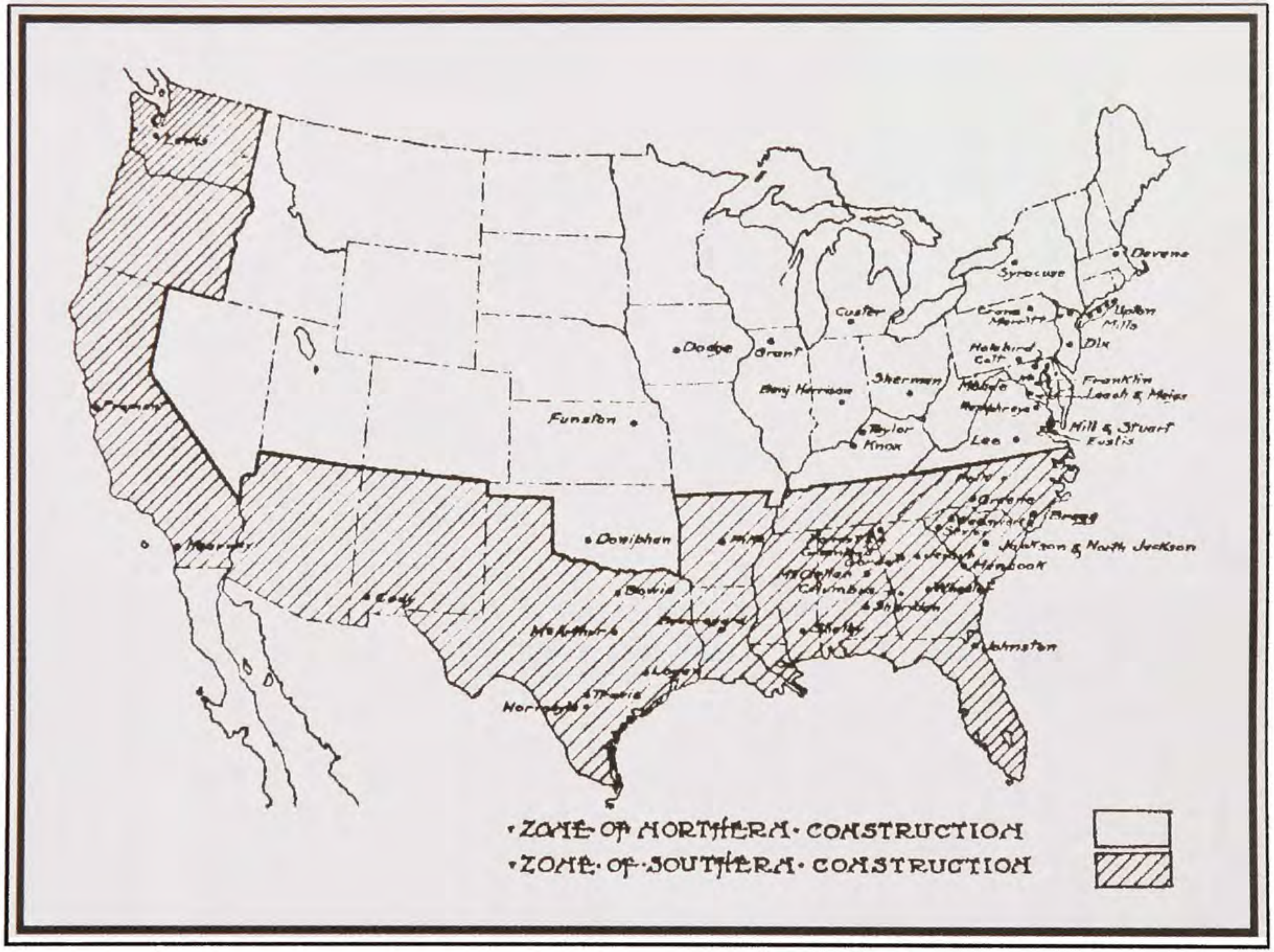
Basic differences in approach to design and construction soon surfaced between the Corps and the Quartermaster General's office. The decision was made to design all the camps before any construction began (Figure 11-5). The rationale was that a uniform plan could be implemented more quickly and would be less costly. Thirty-two similar projects would be constructed concurrently on as many sites.[34] Although the uniform plan was authorized, all did not go well. Several building innovations evolved during the construction period; one that for many years has served as a standard of Army construction is the two-story barrack (Figure 11-6). The design rationale was cost efficiency; two-story structures could be built as rapidly as one-story units and offered more efficient space utilization. The concept was perpetuated throughout the United States when many of these camps were reactivated and converted to forts during the mobilization for World War II.

Provision for the cavalry also was included in camp design; every camp had to have a major facility built for the care of horses. Figure 11-7 shows a "remount station" or horse barn.

World War I also gave rise to the Army Air Corps, which eventually became the U.S. Air Force. The earliest hangars were steel or wooden structures (Figure 11-8). Examples of the airfields constructed during this period in the Mobile District are Payne Field in West Point, Mississippi, and Taylor Field in Montgomery, Alabama.[35]

The interest in military aviation is apparent as well in the development of the Pensacola Naval Air Station. The school in Pensacola, an outgrowth of the original school at Annapolis, was started in January 1914 when aviation was in an embryonic stage. The school continued to grow even though much of the training was experimental; World War I spurred its rapid expansion. By the end of the war, Pensacola was one of seven naval air stations located throughout the United States.[36]

Specific operations took place under the Corps of Engineers at Pensacola during World War I. General preparation for seacoast defenses as of June 1917 included dredging



Map 11-2. Map of the Northern and Southern Construction Zones for Military Facilities, World War I, Construction Division of the Army (National Archives).

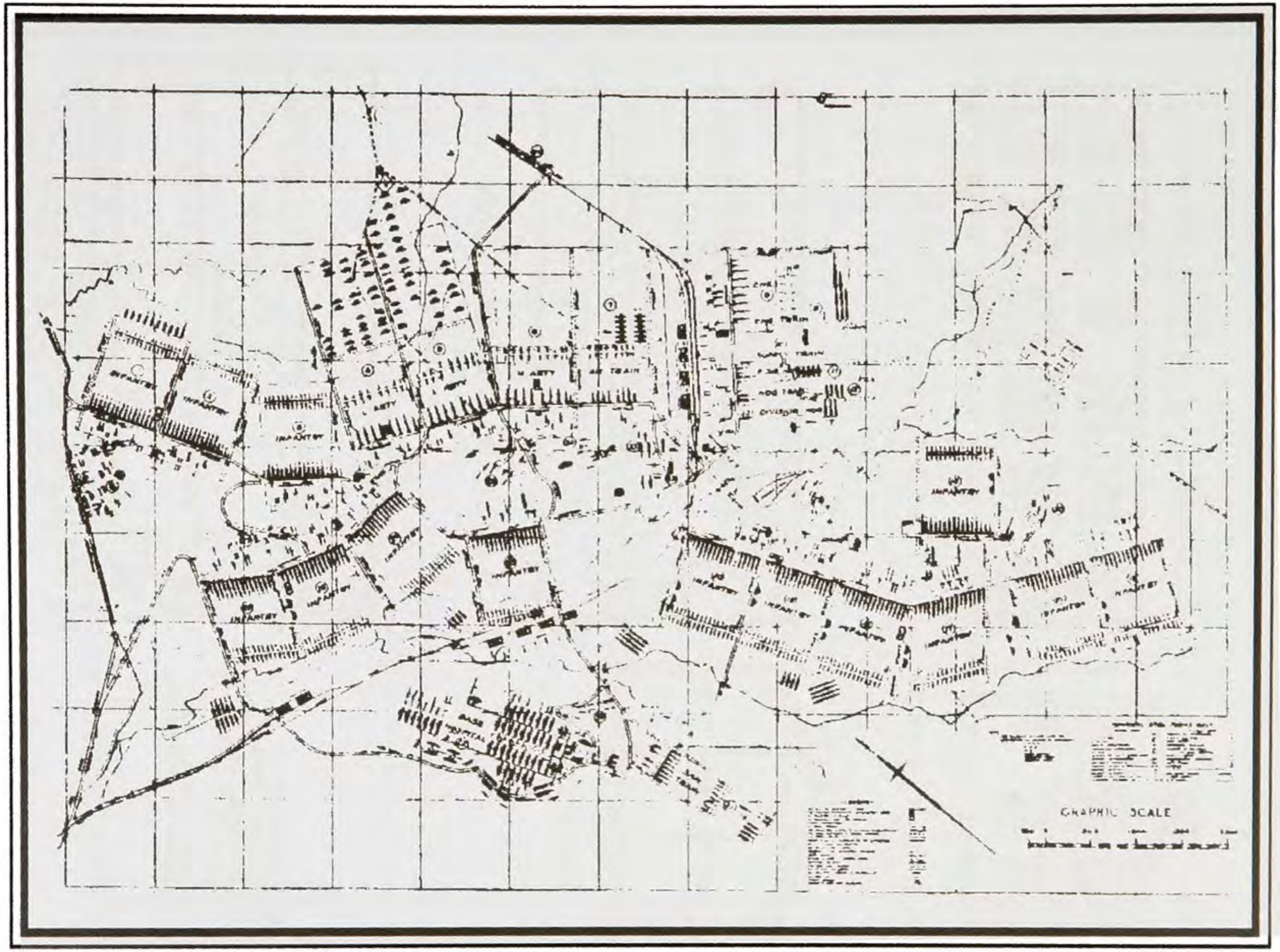


Figure 11-5. General plan, Camp McClellan, Alabama 1918 (National Archives).

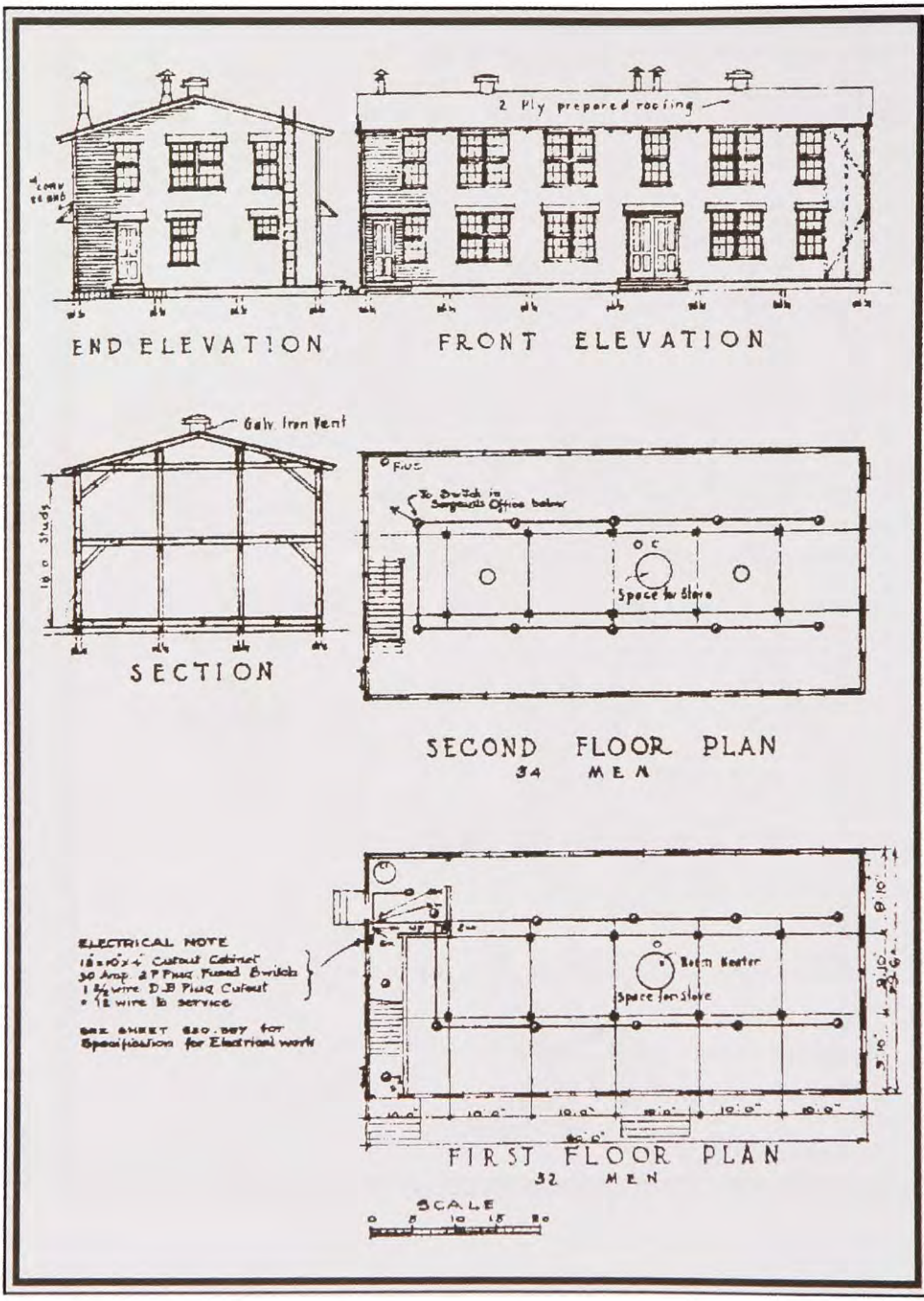


Figure 11-6. Typical buildings, 66-man barracks, Construction Division of the Army, 1918 (National Archives).

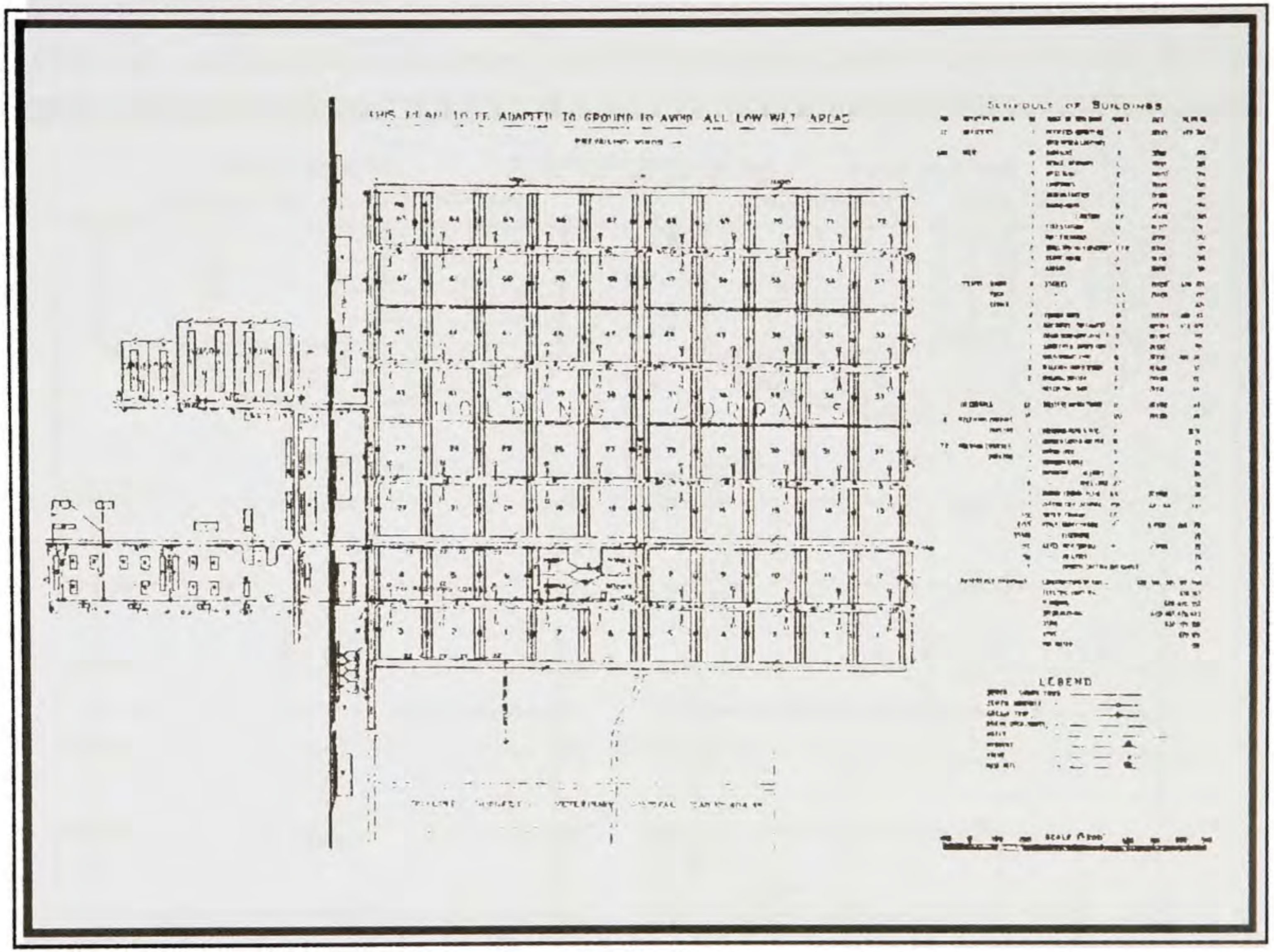


Figure 11-7. Typical layout for a remount station (cavalry horse barn) for 7,500 animals, Construction Division of the Army. 1918 (National Archives).

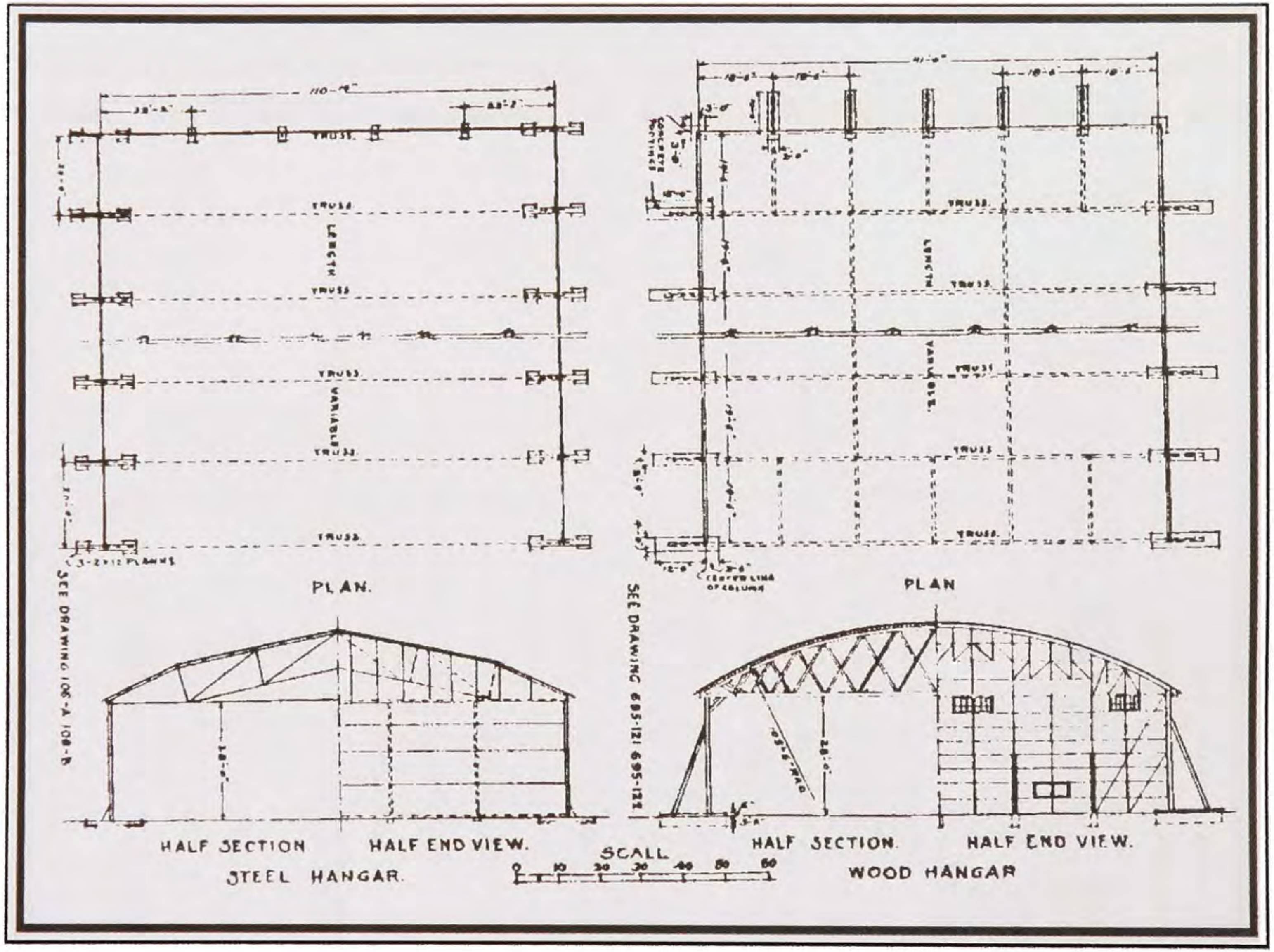


Figure 11-8. Plan for standard steel and wood hangers, Construction Division of the Army, 1918 (National Archives).

a channel from deep water in the bay to the beach line. Channel dimensions were 125 feet wide by 7 feet deep by 850 feet long. The channel was necessary for delivery of supplies and obviated the need to build 850 feet of additional wharf. In addition, two 60-foot towers for floodlights were erected and more than 2,200 feet of rail lines graded.[37] Other searchlights were installed in various locations around the military reservation.

1 *Mobile District History*, p. 54.

2 Eben Eveleth Winslow, *Notes on Seacoast Fortification Construction*. U.S. Army Engineer School Occasional Papers, No. 61 (Washington, DC: GPO, 1920), p. 14. Hereafter cited as Seacoast Fortification Construction.

3 Winslow, *Seacoast Fortification Construction*, p. 14. See also Emanuel R. Lewis, *Seacoast Fortifications of the United States: An Introductory History* (Annapolis, MD: Leeward Publications, Inc., 1970), p. 66. Hereafter cited as *Seacoast Fortifications*. Lewis' work is the authoritative source on the evolution of seacoast fortifications and of ordnance technology in America. The works published by both Winslow and Lewis are based on the most significant report of the period, commissioned by the President of the United States and chaired by the Secretary of War, William C. Endicott. Endicott's report from the Board on Fortifications was published in 1886 and focuses on a detailed assessment of the armaments needed to defend America's coasts. The two volumes contain reports on armor, torpedoes, improvements in naval armor, national capability for armaments production, and other detailed information. The document was published as House Executive Document 49, 49th Congress, 1st Session, 23 January 1886 (Serials 2395 and 2396 of the *U.S. Serial Set*). Lewis' work is more suitable for the average reader and effectively assesses of the sweeping changes taking place in ordnance technology. Citations are taken from Lewis' work because of its overview quality, and because the work is more accessible to the general public than volumes of the original document.

4 *Seacoast Fortifications*, p. 67.

5 Ibid., p. 68.

6 *Seacoast Fortification Construction*, p. 14.

7 *Seacoast Fortifications*, p. 69.

8 Ibid., p. 70.

9 *Seacoast Fortification Construction*, p. 15.

10 *Seacoast Fortifications*, pp. 70-75.

11 Ibid.

12 Ibid., p. 89.

13 Ibid., p. 93.

14 Ibid.

15 U.S., Congress, House, Report *of the Board on Fortifications or Other Defenses*, H. Exec. Doc. 49, 49th Cong., 1st sess., 1886, p. 8.

16 *Mobile District History*, p. 55.

17 *Seacoast Fortifications*, p. 79.

18 Ibid.

19 Ibid., pp. 79, 83.

20 Ibid., pp. 89-93.

21 Ibid., p. 93.

22 *Mobile District History*, p. 57.

23 James C. and Irene S. Coleman, *Guardians of the Gulf: Pensacola Fortifications, 1698-1980* (Pensacola, FL: Pensacola Historical Society, 1982), p. 42. Hereafter cited as *Guardians of the Gulf.*

24 Ibid.

25 Ibid., p. 52.

26 Two works published on Fort Pickens give minute detail on all aspects of the rearming of the fort under both the Endicott and Taft Board recommendations. See Edwin C. Bearss, *Historic Structures Report, Fort Pickens, Historical Data Section, 1821-1895, Gulf Islands National Seashore, Florida/Mississippi* (Washington, DC: U.S. National Park Service, 1983); and *Historic Structure Report and Resource Study, Pensacola Harbor Defense Project, 1890-1947, Florida Unit, Gulf Islands National Seashore, Escambia and Santa Rosa Counties, Florida* (Denver, CO: U.S. National Park Service, 1982). Hereafter cited as *Pensacola Harbor Defenses Project, 1890-1947*. Unless otherwise noted, however, the manuscript summary is based on the latter work.

27 *Pensacola Harbor Defense Project, 1890-1947*, p. 43.

28 Ibid., p. 79.

29 Ibid., p. 88.

30 *Guardians of the Gulf*, p. 90.

31 Brig. Gen. R.C, Marshall, *History of the Construction Division of the Army, 1919*, RG 77, Entry 404 - Construction Division History, Box No. 1, Vols. 1-3, p. 1. Hereafter cited as *History of Construction*.

32 Lenore Fine and Jesse A. Remington, *The Corps of Engineers: Construction in the United States* (Washington, DC: U.S. Army, Office of the Chief of Military History, 1972). Hereafter cited as *Construction in the United States*, Chapters I through VII describe the internal military power struggle for control of construction. The contest spanned 20 years and the Corps was ultimately given responsibility in 1940.

33 *History of Construction*, p. 7.

34 RG 77, Entry 404, Boxes 1,6, and 7. "The National Army Cantonments" article relates construction history, and is accompanied by newspaper clippings of construction of Camp Shelby, Mississippi. See as well *History of Construction*, Box 1, Vols. 1-3, p. 73.

35 Names of the air fields were taken from the official Project Map, Construction Division of the Army, U.S. War Department, April 1, 1919. RG 77, Entry 404, Map Military Projects, Box 1, Book No. 1.

36 *Guardians of the Gulf*, pp. 75-77. An important resource for this period is George F. Pearce, The U.S. Navy in Pensacola (Gainesville, FL: University Presses of Florida, 1980).

[37] RG 77, Entry 1263, Annual Reports to the Federal Power Commission Relating to Defenses and Fortifications and to Floating Plant, 1917-1931. These documents are misnamed in the records at East Point, Georgia. The correct entry name should be Montgomery Office, Annual Reports to the Chief of Engineers Relating to Defenses and Fortifications at Pensacola, Fla. and to Floating Plant, 1917-1931. Several documents included in this file relate to the project plans by the Coast Artillery for the defense of Pensacola.

XII. World War II and Its Aftermath, 1940-1955

World War II resulted in the largest wartime mobilization effort ever for the United States. The nation, which had neglected its defense responsibilities for several decades despite concerns voiced by the Chief of Engineers and other military officials, found itself unprepared for the level of involvement it ultimately would have in a war it wanted no part of. The Mobile District experienced a time of hectic activity as the nation geared up. A dramatic increase in the number of airfields was required; many of the training bases were located in the South because of favorable flying conditions nearly year round.[1] At the onset of the war, the Quartermaster General's office was still in charge of military construction. However, Army airfield construction was transferred to the Corps of Engineers in 1940, and in December 1941 all military construction came under its jurisdiction. Mobile District was assigned a principal part of the new airfield construction.

The magnitude of Mobile District's work can be judged by expenditures for construction. Between December 1941 and December 1943, nearly $1 billion was expended in the District on facilities that included 32 Army airfields, an ordnance training center, two arsenals, three Army Ground Force depots, five harbor defense installations, nine Civil Aviation Administration airfields, two Army Air Force supply depots, one Army Air Force cantonment, six ordnance manufacturing plants, nine Army Ground Force cantonments, and six special installations (including the War Dog Training Center, Cat Island, Mississippi; bombing ranges in Hancock and Pachuta Counties, Mississippi; the Chemical Warfare Service Station for the Jackson project; and a number of prisoner- of-war internment camps).[2] Many of the construction responsibilities assigned to Mobile District for the World War II effort continued through the Korean conflict of the 1950s. The District continues to have construction responsibility for the U.S. Air Force, a major aspect of the Corps' service role as a government construction agency.[3]

Construction accomplished for the war effort was temporary; most structures were expected to have a five-year life. This reflected the construction philosophy of World War I. When the Corps became responsible for military construction, there was an immediate need to house more than 1.5 million troops. One of the first efforts was to try to rehabilitate some camps constructed by the Quartermaster General's office during World War I. While the sites were well chosen, facilities were not constructed to withstand 20 years of neglect in the moist environment of the South. Buildings were decayed and in most cases had to be torn down. The Corps had to begin with new construction designs, while each day more units were needed. These were times of great pressure and imminent threat to the nation.

The District's workload escalated quickly with demands on personnel. Some projects called for construction skills that the Corps had not provided its officers. The District was faced with the need for architects, structural specialists, pavement specialists, heating and cooling experts, sanitation engineers, and specification writers. Some of these skills were acquired through recall of individuals with officer commissions in the Army Reserves; others came from the public sector.

World War II was an important period for establishing the pattern of military and civilian personnel that characterizes the Corps' current organization. Many of the military responsibilities became permanent following the Korean conflict, and the Mobile District had a burgeoning military and civil works responsibility. Military construction responsibility evolved from temporary-use facilities to permanent installations requiring perpetual maintenance and modernization. All of this required a large, diverse, and highly skilled civilian component to complement the military specialization.

The temporary nature of the District's World War II construction program was attested to by the fact that in 1950 only 20 permanent installations were listed for the Engineering Division, although hundreds of projects were completed.[4] The records of the War Assets Administration, a Federal agency responsible for liquidating military surplus following World War II, also show that the government rapidly dismantled internment camps, ordnance facilities, some hospitals, airfields everywhere, and a number of other types of installations and support facilities built for the war effort.[5]

Army Airfields

Some of the first military sites selected for wartime construction were for the Army Air Corps. By May 1940, three large Air Corps Training Centers were planned for the United States; the Southeast Center was placed in the Mobile District and included the Maxwell, Barksdale, and Eglin Bases.[6] Some of the early sites made use of existing municipal facilities. Doing so facilitated the siting of other strategic operations such as ordnance plants, which had to be built from the ground up. Airfield and ordnance plant site selection was linked.

Events taking place in the European theater of the war increased U.S. sensitivity to the threat of air attack. An old War College dictum dating from 1915 about location of supply depots and ordnance plants, or strategic manufacturing plants for military supplies, was resurrected and became the basis for deciding where strategic support facilities could not be built. Ordnance, for example, was not to be located within 200 miles of the coast and preferably was to be located within one of five strategic zones (Map 12-1).[7]

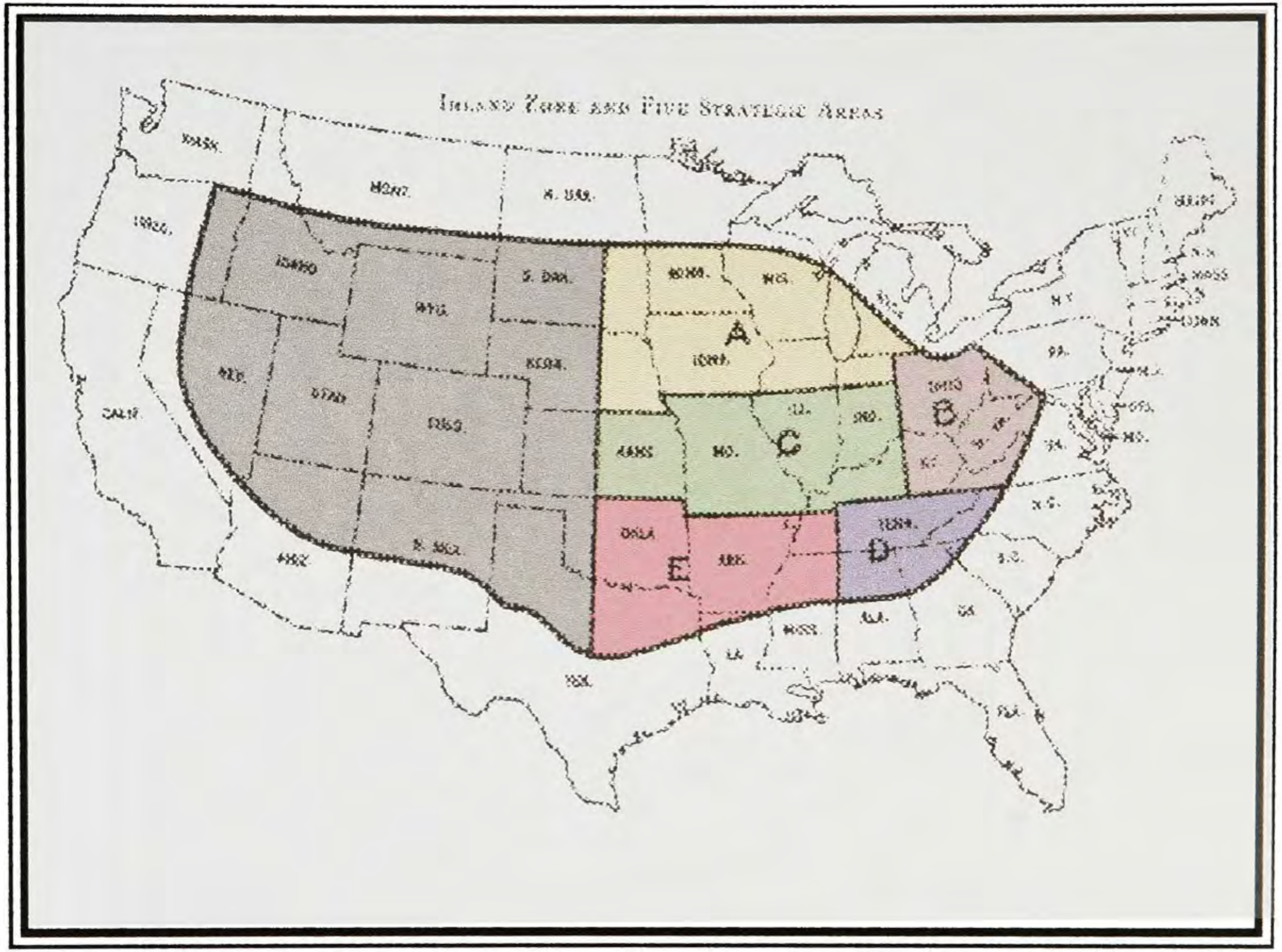
Ordnance was the service requiring the largest number of plants and among the criteria for site selection was the availability of water, power, transportation, labor, and materials. Efforts to locate plants to achieve geographic balance and equitable employment opportunity lost out to the industrial dictate of greatest production at lowest cost. Plants, therefore, often were located where production and transportation could be maximized. The Alabama Ordnance Works site on the Coosa River, for example, was chosen because smokeless powder factories required large quantities of water.[8]

The transfer of airfield construction to the Corps resulted in some major design and construction problems nationwide. Interagency squabbling had hampered development at a critical juncture in the war build-up when massive work needed to be done. What resulted was a change in everything from site selection procedures through design and construction. Problems resulted for District Engineers across the country, as illustrated by the situation at Mobile's Brookley Field in January 1941.

Brookley Field

Construction began at Brookley Field in 1939 under the direction of the Quartermaster General's office. Brookley, also known as the Southeast Air Depot, was a major installation occupying a 1,350-acre site just south of Mobile. As with many airfields, part of it was municipal property donated by the City of Mobile during the bidding to attract defense contracts and employment opportunities. Nonetheless, progress at the site was exceedingly slow, which became apparent to the District Engineer when the construction transfer was accomplished. The ground water level was only one to four feet below the surface, and there were terrible drainage problems. Without expensive drainage operations the soil was not suitable for use by aircraft.[9] The District was forced to build the necessary drainage systems.

Despite such topographic drawbacks, the Brookley site offered a number of advantages. It adjoined Mobile Bay, which could be used to make a sea-lane connection



Map 12-1. A map of inland zones and strategic areas used by the Army to determine location of strategic support operations, 1940 (*The Corps of Engineers: Construction in the United States*, 1972).

with the base. It was well served by rail including lines owned by the Louisville and Nashville, the Southern, and the A.T.&N. Railroads. The site also was accessible from the city via automobile and bus routes. Electrical power was readily available and the area was sparsely inhabited except for the municipal airport complex and property along the bay.[10]

Construction proceeded so slowly at Brookley and elsewhere that the War Department put all construction on double shifts effective 1 July 1941 to ensure that the depot would be fully operable by 1 January 1943. Brookley was the most important war project for the City of Mobile: it created numerous jobs and a big demand for materials. Labor and materials, however, were a constant problem for District Engineers all over the United States. Part of the problem was reduced manpower because of the troop priorities. In addition, contractors were in short supply and were pressured to meet deadlines without the advantage of a reliable work force. Skilled laborers were in such high demand that they could move from job to job, improving their salaries with each move. The War Department ultimately was able to control labor to some extent. This was accomplished by job freezing, which required people to finish one job before leaving for another; by passing vagrancy laws requiring that all able-bodied men be gainfully employed; and by hiring women for many jobs formerly restricted to men.[11]

Brookley's significance cannot be underestimated. As a regional air depot it provided a broad range of services to tenant organizations such as the Air Service Rescue, the American Red Cross, the Department of the Air Force Air Traffic Coordinating Office, the Grumman Aircraft Engineering Corporation, Northrop Aircraft Corporation, the office of the Mobile District Resident Engineer, and the 1735th Air Evacuation Squadron, among some 30 organizations.

Under Mobile District's supervision, construction at Brookley progressed dramatically. Between July and December 1941 over $2 million in work was completed. By early 1942, the base was partially operable and in March 1942 the first B-24 planes arrived for modification.[12] An additional $9 million in contracts were let the same year. By the time the base was fully operable in 1943, more than $15 million had been spent and nearly 3 million square feet of work area was under roof.[13] Between 1943 and 1946, an additional 1 million square feet of warehouse space was completed, two Test Engine buildings were finished, 130 auxiliary buildings were constructed, and a 7,000-foot runway was completed (Figure 12-1). The base continued to be the major center of Mobile District operations through the 1960s, when a new office complex was built in downtown Mobile.

Airfield construction proceeded rapidly across the District. The number of fields in operation in 1942 (Map 12-2) nearly doubled by 1946 (Map 12-3). Postwar real estate records indicate that many of the airfields were leased from private land owners. During the war, the District graded the runways, constructed drainage systems, and maintained the sites.

One of the primary reasons for the acquisition of numerous airfields was the shift in military preparedness to reliance on the Air Corps rather than the Navy. The resulting demand for pilots meant that many training facilities had to be built and rapidly.[14] The Corps was responsible for building not only flight-training fields, but Civil Aviation Administration (CAA) airfields. Many of the CAA fields were municipal fields already in operation; their military use was as auxiliary fields. The Mobile District worked with local communities to bring these airfields up to a higher standard by extending runways and illuminating them for night-time operation.[15]

Many of the airfields, as noted, already were designed or constructed by the time Mobile District gained wartime control of them. Still, the work done by the District helped

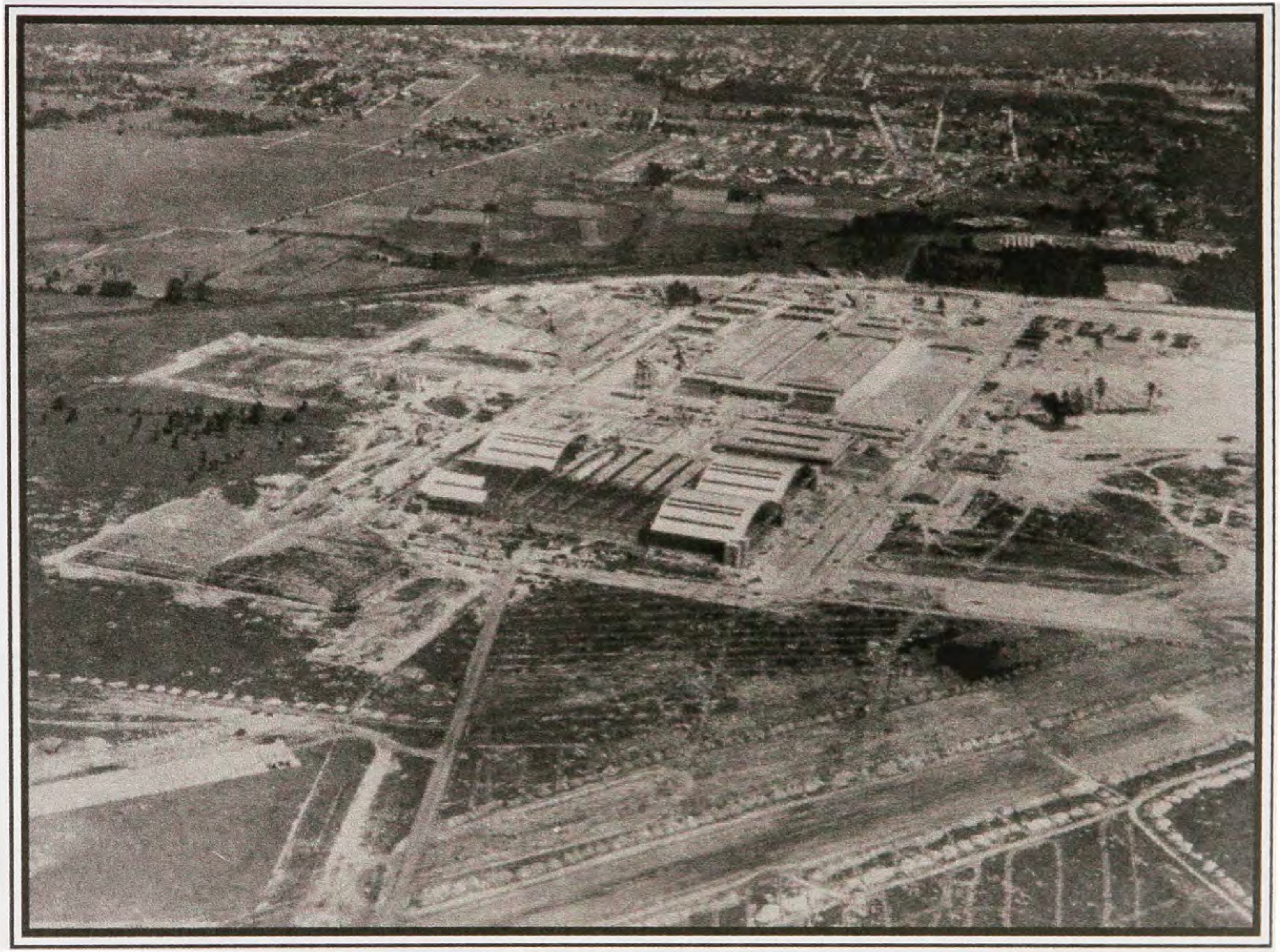
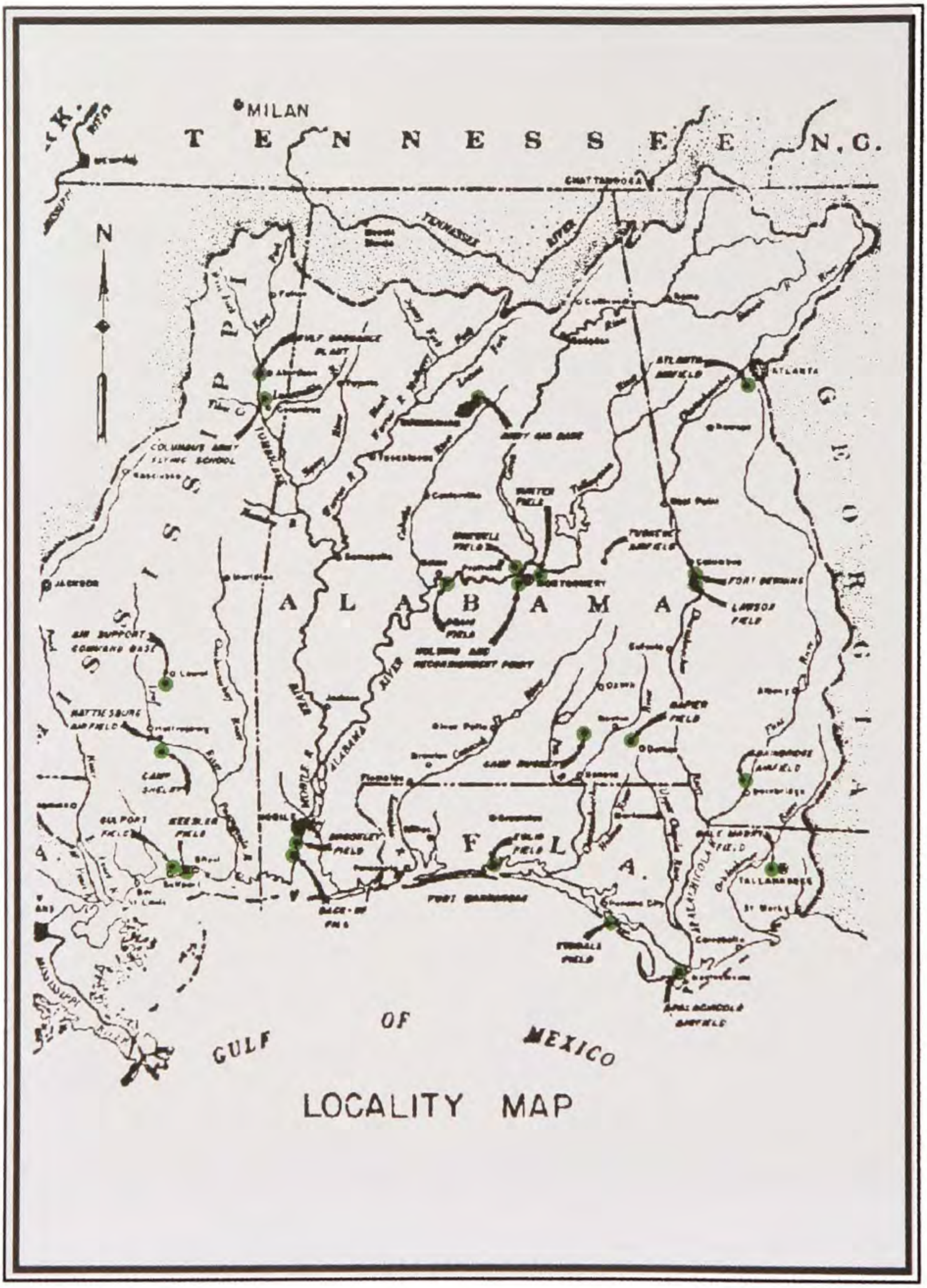
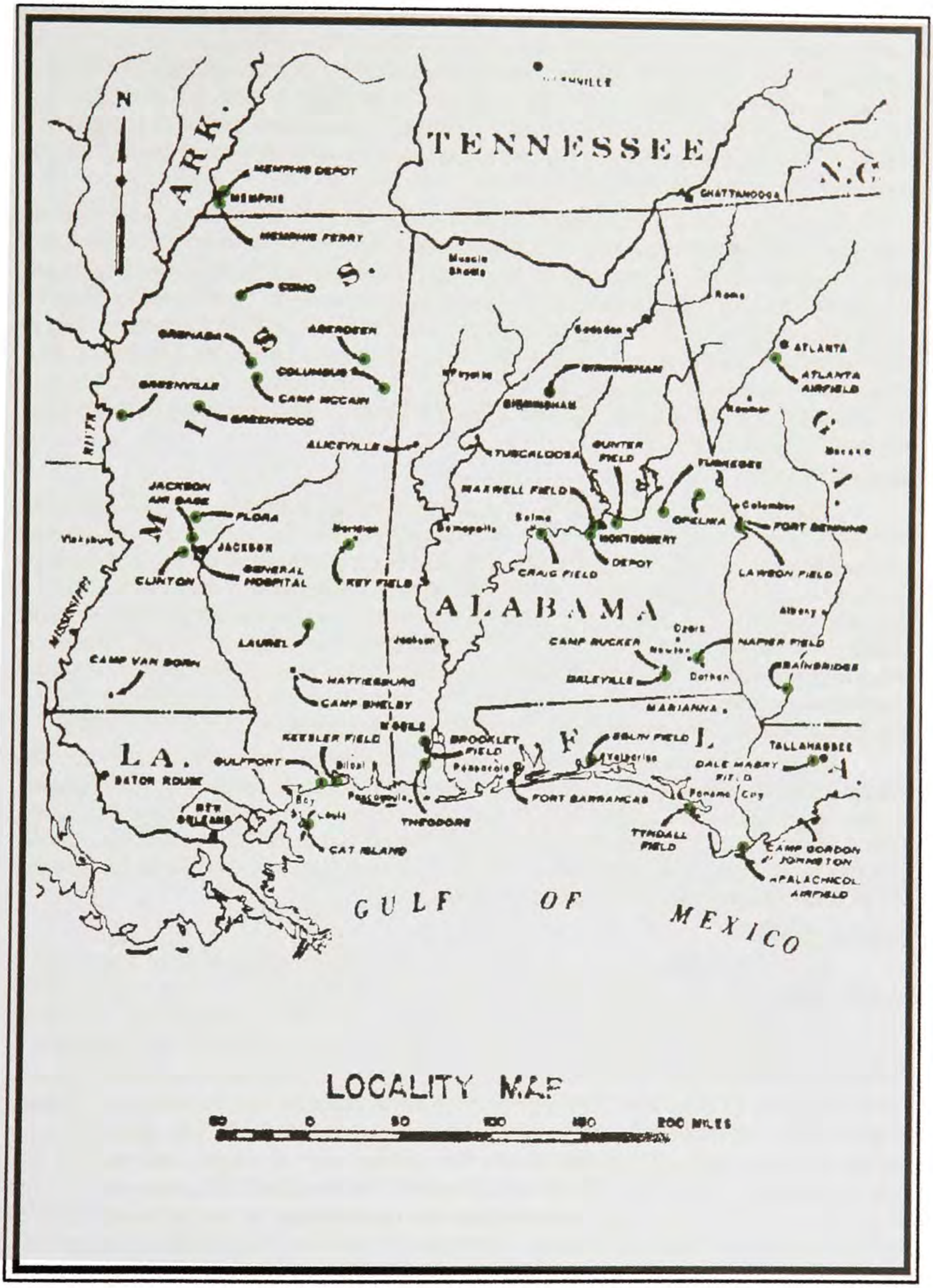


Figure 12-1. An aerial view of Brookley Field, circa 1940 (Public Affairs, MDO).



Map 12-2. Location of Mobile District airfields, circa 1942 (National Archives, East Point, Georgia).



Map 12-3. Location of Mobile District airfields, circa 1946 (National Archives, East Point, Georgia).

solidify its reputation as the construction agency for the Army Air Corps. Construction requirements would come to the Corps from the user agency. In the case of Brookley, for example, the Air Corps informed the District Engineer the types of landing strips needed, the length and width of runways and the loads they would have to bear, and other pertinent information. The chain of command varied by project, sometimes coming from the Office of the Chief of Engineers through channels to the District and at other times coming directly from the OCE to the District.[16]

Once the project needs were conveyed to the District's Engineers, a set of plans were prepared. A review process was in place both within the higher echelons of the Corps and between the District and the user agency. When all parties were satisfied that the project was feasible and designed to satisfaction, then a contract was let. Sometimes a contractor would take the project from start to finish by completing all military aspects as well as housing, electrification, and support facilities. Many engineer-architect firms had a complete design unit that could handle the entire package. The drive toward completion was such that construction personnel waited at the drafting tables for completed plans because "there was no time to be wasted."[17]

Maxwell Field

Maxwell Field in Montgomery, Alabama was another important operation involving Mobile District. The history of aviation at Maxwell dates to the earliest days of aviation experimentation; the base even has a link with the Wright Brothers' research. Although the base was used during World War I to train pilots, the first permanent construction did not take place until 1927.[18] A hallmark in the base's development occurred in 1929 when the decision was made to transfer the Air Corps Tactical School from Langley Field, Virginia, to Maxwell Field. Favorable weather conditions made flying around Montgomery almost a year-round operation, hence the area offered a strategic advantage for training pilots.[19] Because additional land was needed, the transfer was not completed for several years.

By the late 1930s, Maxwell was a large air installation. It was the institution in the United States for training Air Corps officers and other military services in such aviation aspects as attack, bombardment, pursuit, and observation.[20] Throughout the 1940s, as the United States became increasingly involved in the air war over Europe and the Pacific, facilities at Maxwell were expanded to handle increased numbers of officers for training and to accommodate more sophisticated aircraft.

Keesler Field

After Biloxi was chosen as the site for a major flight training base in March 1941, Mobile District developed construction plans for the new air base.[21] The original plans were based on an estimated capacity of 12,000 men to be served by 311 buildings. The final project design was amended to accommodate 24,560 men to be supported by 661 structures.[22] The project would require 376 two-story barracks housing 63 men each. Site preparation in Biloxi began on 13 June 1941, and construction of the barracks was underway by 24 June (Figure 12-2). Unfortunately, construction delays soon materialized. The problems were similar to those plaguing Engineers all over the District: labor shortages, bad weather, and lack of materials.[23] Because of the delays, Keesler's first recruits lived in tents on the edge of the base. By mid-July, most construction was concentrated on the technical facilities such as training buildings and hangars. Shortages of materials plagued this aspect as well, even though technical facilities often were given priority over support structures. By mid-December, the support buildings were virtually completed and over 260 barracks were occupied (Figure 12-3). The technical facilities were expected to be completed by March 1942.[24]

Figure 12-2. Construction of 63-man barracks, Keesler AFB, Mississippi, 1941 (Public Affairs, MDO).

Figure 12-3. General view of completed housing, Keesler AFB, Mississippi, 1948 (Public Affairs, MDO).

Keesler's primary mission was to train frontline aircraft mechanics. The base has retained that responsibility and has added training facilities. As the training needs have expanded, the Mobile District has been called on to construct additional facilities.

Eglin Field

The Corps association with Eglin Field is a long and productive one. It evolved from an improvement to the Valparaiso airport near Fort Walton, Florida. The airport was serving as an auxiliary facility for Maxwell AFB in Montgomery, however, by the time World War II began, the arrangement had become awkward both administratively and operationally.[25] Eglin was made a base in its own right and designated as the Air Proving Ground on 15 May 1941. It became the largest AFB in the United States and a leader in the development of military aviation.[26] Eglin Field played a key role in the development of aeronautical sciences, armament testing, experimental testing of all types, and pilot training. The field played an important role in World War II, the Korean conflict, and the Vietnam War.

Many significant historical events have occurred at Eglin including the construction and operation of a climatic hangar (Figure 12-4) used to test aircraft and equipment for operational suitability in extreme climates and construction of a railroad using German prisoners of war.[27] The hangar could test equipment at -65 degrees Fahrenheit, a procedure that previously had to be conducted in natural environments.[28] In addition, Eglin was used by Lieutenant Colonel (later Lieutenant General) James H. "Jimmy" Doolittle and his Tokyo Raiders for a brief training period in March 1942.[29]

The Corps was responsible for runway construction at airfields, and was challenged in meeting the needs of increasingly larger and heavier aircraft. Runway length and load-bearing capability became critical to the successful development of aircraft. By upgrading such facilities for continually more sophisticated aircraft, the Mobile District provided a major support service to the Air Force. Noteworthy, among the tests conducted at Eglin was that for the B-29 group headed by Colonel (later General) Paul K. Tibbets, the pilot who flew the *Enola Gay* when it dropped the atomic bomb on Hiroshima.[30]

Army Camps

The District was responsible for construction of all general support facilities for military operations within its boundaries, including Army camps.

Camp Rucker

Originally a soil conservation project (the Pea River Cooperative Land Use Project), Camp Rucker was built jointly by the Civilian Conservation Corps (CCC) and the Works Progress Administration (WPA) for use as an infantry training center (although its chief mission has since changed). The camp was converted from a CCC camp to a military base during the mobilization period leading up to World War II, and construction was completed between January and March 1942.[31] It was occupied officially on 1 May 1942 as the Ozark Triangular Division Camp and renamed Camp Rucker in June 1943. The camp was deactivated in 1946 and was not reopened until the Korean conflict.

Fort McClellan

Fort McClellan, Alabama, is one of the larger World War I cantonments that continued to be important after hostilities ended in 1919. The camp was used as a demobilization center following the Armistice, and then as a summer training camp for the Fourth Corps Area.[32] The camp's status changed in 1929 when it was designated a fort. Appropriations continued throughout the 1930s, and construction to accommodate larger contingents of trainees was routine.

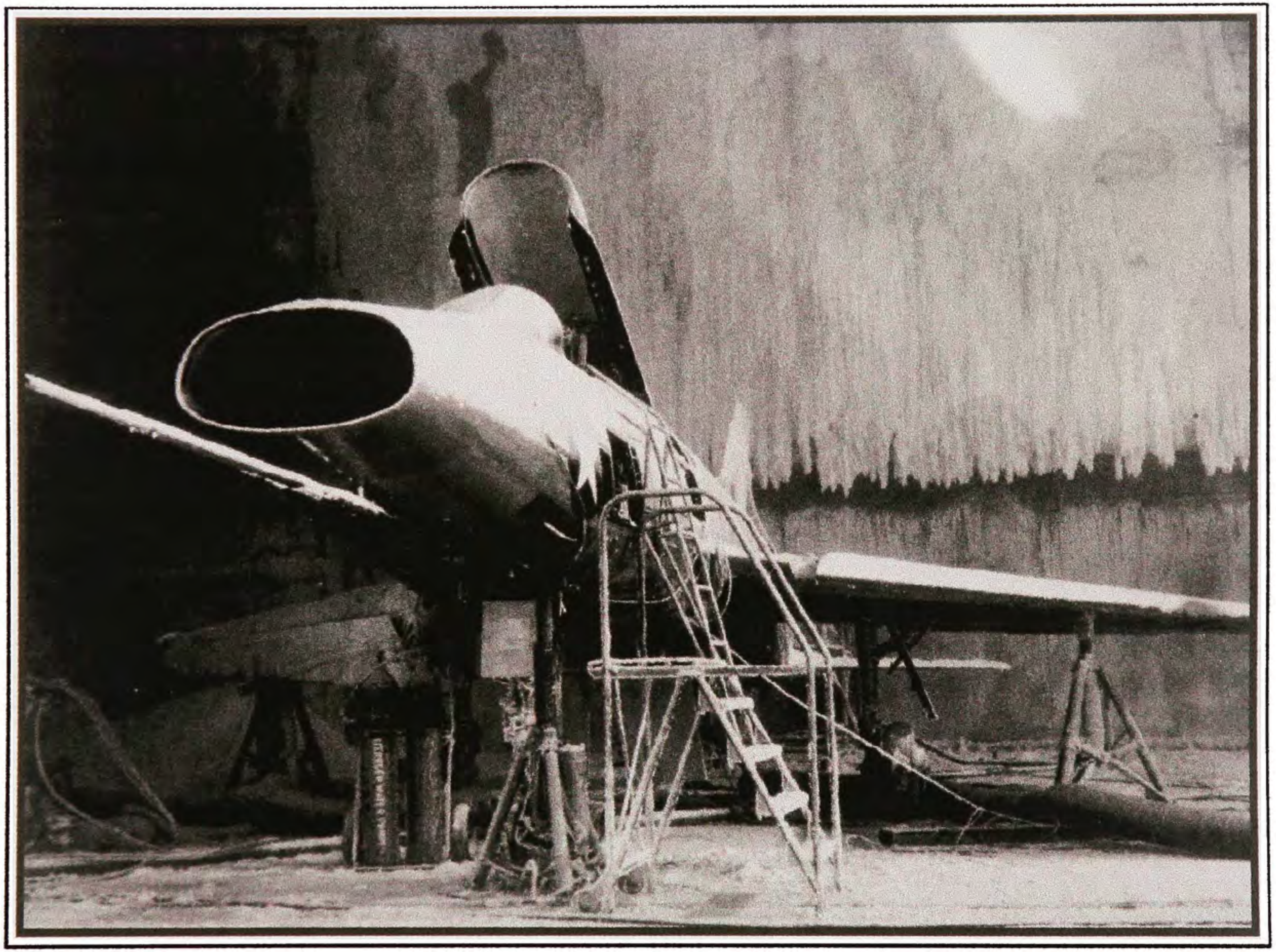


Figure 12-4. The climatic hangar, Eglin AFB, Florida, 1940s (Public Affairs, MDO).

Fort McClellan was an active installation at the time of mobilization for World War II. It was used for Reserve and National Guard training. In addition, it served as the headquarters for the 22nd Infantry and the 4th Tank Company and also for 45 CCC camps throughout Alabama, Florida, Mississippi, and Tennessee.[33]

During World War II, the number of troops at the fort increased significantly. The Mobile District constructed 282 temporary buildings, 2,758 enlisted men's tents, 376 officers' quarters, 91 storehouse tents, and a host of other facilities ranging from utilities to mess halls. Because the increased activity required more acreage, land adjacent to the military reservation was purchased connecting the reservation to the Talladega National Forest. With this national forest land, the fort had 485,612 acres on which to conduct training exercises on land simulating virtually all known World War II terrain.[34]

Over $5 million were spent in improvements and additions in the first years of the war. In 1942, still more troops arrived in the area, including the 92nd Division (Negro). Over 6,500 men of the 92nd Division camped at Fort McClellan before being transferred to Arizona. A prisoner-of-war camp for 3,000 prisoners was also constructed in 1942.

Infantry training continued throughout the war. Numerous permanent improvements were made, with $17 million expended between 1941 and 1943. The Mobile District office monitored construction.

Special Installations

Prisoner-of-War Camps

Another Mobile District activity in World War II was construction of POW camps (Figure 12-5). The War Department began the program in 1942 in order to relieve overcrowding in German prisoner camps in Great Britain.[35] The government originally intended to send most of the prisoners to the Southwest, but as the numbers swelled various military facilities and temporary camps were used all over the United States. By the end of 1942, 33 camps were either completed, or nearly so, to house over 70,000 prisoners. Eleven of these camps were in the southeastern part of the country. Only one camp was designated for Alabama, though others were built later.

Construction of POW camps had to proceed rapidly. The first camp in Alabama was built in Aliceville, a small rural community in Pickens County. (The local populace originally was not informed of the nature of the construction project because of the strong anti-German bias in America). The Corps of Engineers arrived in August 1942, and within a month the Montgomery firm of Algernon Blair was preparing the site. The project immediately began pumping as much as $75,000 per week into the local economy. To explain all the activity surrounding the construction, a late-September announcement revealed that the project would be an "alien concentration camp." With Corps guidance, construction crews worked feverishly; the camp was completed well ahead of schedule and was ready for occupants in December. The pace of construction and the lack of materials (facilities for U.S. troops took priority) underscored the temporary character of the POW facilities. Some of the buildings had no more than packed dirt floors.[36] The complex at Aliceville, the largest in the state, consisted of 400 frame, one-story buildings and could house 6,000 prisoners.

Increasing numbers of prisoners resulted in the rapid construction of three additional camps in Alabama. Soon after construction began at Aliceville, a second camp was built at Opelika. The camp, large enough for 3,000 prisoners, occupied an 840-acre site near the southern limits of the city. To facilitate rapid construction, design and layouts for the camps were standardized. Thus, the camp at Opelika was similar to Aliceville except for its capacity

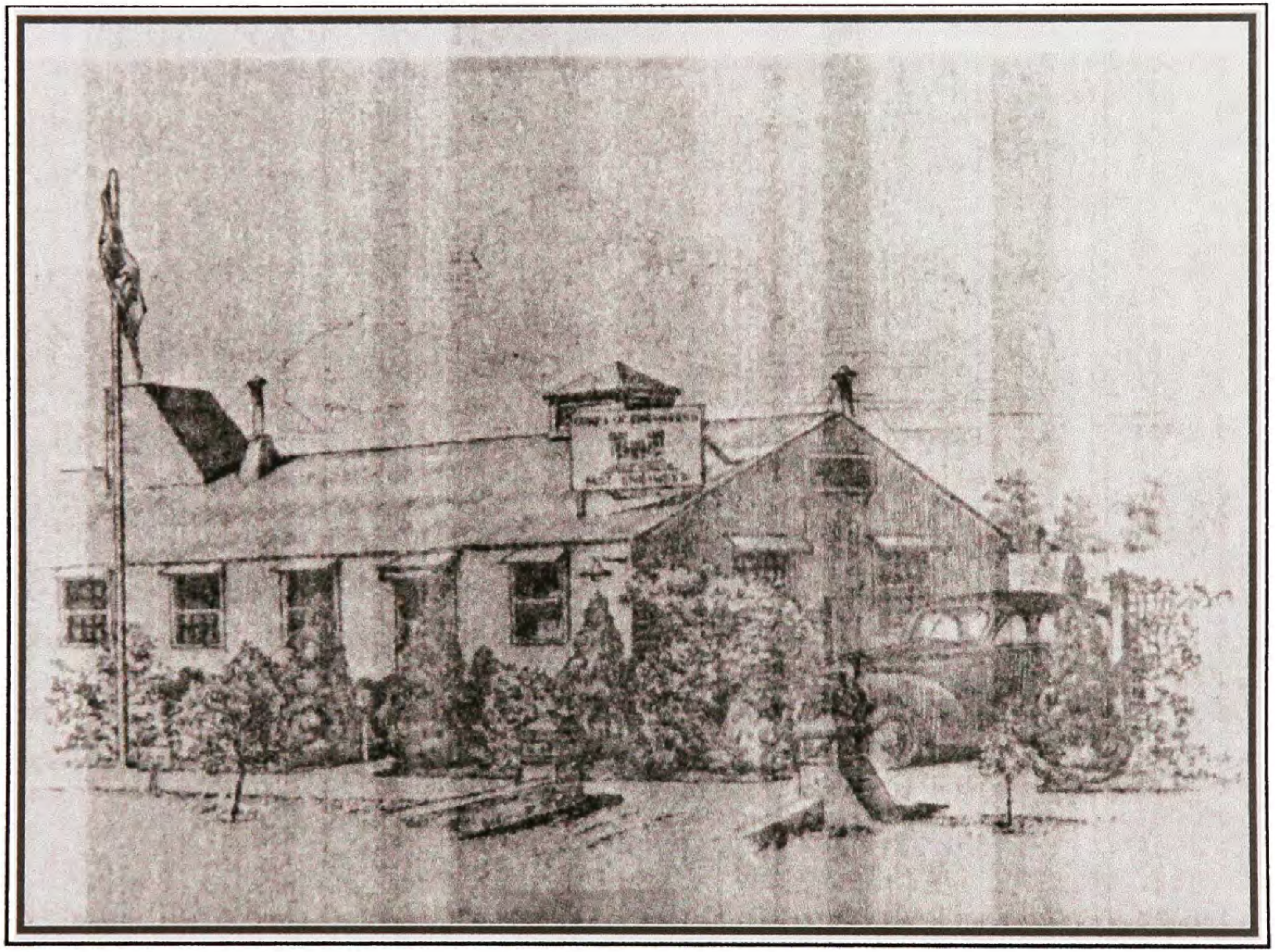


Figure 12-5. Aliceville POW camp, pen and ink sketch of Engineer headquarters circa 1940s (Alabama Department of Archives and History).

and some minor details of layout (Map 12-4). Although facilities built for prisoners may have been rudimentary and low cost, all of the camp properties increased in value. Opelika was constructed in 1942 for less than $100,000; when deactivated and disposed of through the War Assets Administration (WAA), the camp was valued at nearly $1.5 million.[37]

The firm of Smith, Yetter & Company of West Palm Beach, Florida, constructed the Opelika camp. The six-month project was virtually complete by February 1943. The first contingent of prisoners arrived in June, the same month Aliceville was occupied. Prisoners assigned to both camps were mostly former Afrika Korps personnel.[38]

The third Alabama POW camp established was at Fort McClellan; 2,000 prisoners arrived there in late July 1943. Before that camp closed, over 3,000 prisoners were housed. Prisoners at Fort McClellan came mostly from the French theater. While first occupied predominantly by officers, the camp population became more evenly divided between officers and enlisted men before deactivation.

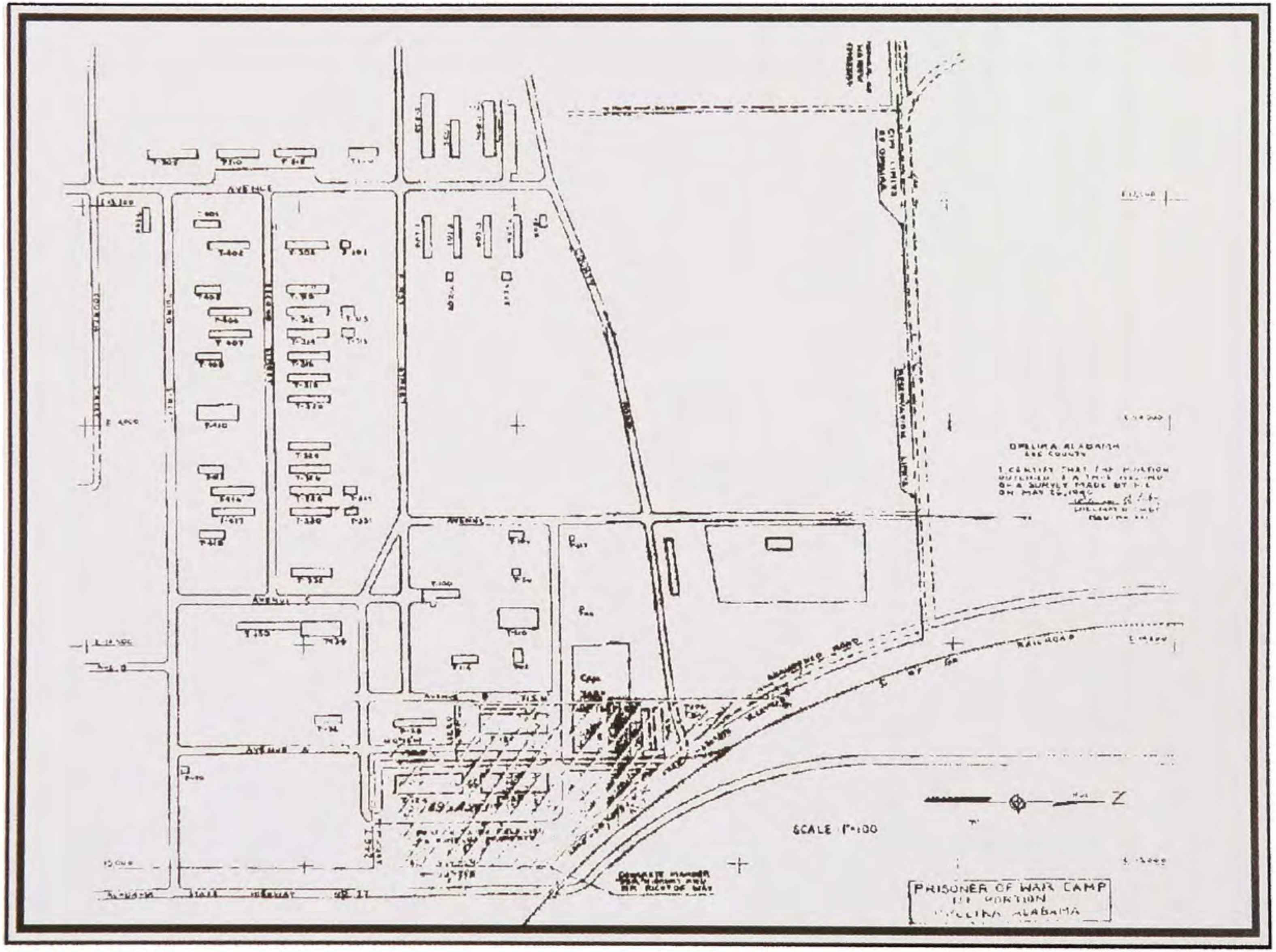
The fourth camp was at Camp Rucker, near Enterprise; it was activated in February 1944. The facility was built in two weeks to satisfy an acute local labor problem.[39] By June 1945 approximately 1,718 detainees were at Camp Rucker. The prisoners were widely used throughout southeast Alabama as farm laborers or in the timber camps.

In addition to the four main camps, numerous auxiliary camps were scattered around the District, generally close to the main camps. Prisoners could be housed temporarily in the auxiliary camps while performing a number of services. Detainees were used for agricultural work, in lumber camps, and as kitchen and hospital labor in urban areas, and could be contracted out to private firms provided specific requirements for their surveillance could be guaranteed. As a general rule, however, German prisoner labor was less than satisfactory. For example, many Aliceville prisoners were so incompetent at picking cotton that they were transferred to the peanut harvest.

All of the camps were deactivated quickly following the war. In accordance with the Surplus Property Act of 1944, the War Assets Administration put all of the camp material up for sale, with the following bidding priorities:

- U.S. Government agencies
- The Reconstruction Finance Corporation, for resale to small businesses
- State and local governments
- Nonprofit organizations

Disposition of facilities at the Opelika camp was typical of the government's postwar efforts to dispose of military properties. In Opelika, 128 buildings and nearly 90 acres of land were transferred to the Public Housing Administration.[40] The Superintendent of Education for Macon County, Alabama, bid on seven surplus buildings to be used for Negro schools. Macon County purchased two buildings from the Federal Works Agency and constructed additional classrooms from materials salvaged from the deactivation of Tuskegee Army Airfield.[41] Opelika sought to acquire part of the camp for public housing and to establish a farmers market.[42] Similar requests were received by the District for surplus materials from all deactivated military projects. The prisoner-of-war camps were but a single item in a huge inventory that included army airfields, ordnance works, and numerous other structures and sites.



Map 12-4. Site plan, Opelika Internment Camp, 1946 (National Archives, East Point, Georgia).

War Dog Training Center, Cat Island, Mississippi

The Mobile District was also involved briefly in a controversial experiment on Cat Island involving Americans of Japanese descent. The troops used were from a special unit selected for the experiment, the 100th Infantry Battalion (Separate) of the 298th Regiment of the Hawaiian National Guard. Mission details were kept top secret from everyone, including the soldiers taking part in the experiment.[43]

The project evolved when a Swiss Army captain convinced President Roosevelt that dogs could be trained, based on smell alone, to attack Japanese. If so, the dogs could be used for military operations in the Pacific theater. After being transferred to Cat Island in November 1942, the troops were told that they would help train dogs for a variety of purposes including scouting, messenger service, sentry work, suicide work, and as attack animals. Many kinds of canine breeds were used including collies, labradors, wolfhounds, boxers, and terriers.[44] The dogs were tormented by the Japanese-American trainers in order to condition them to attack. When the experiment with individual dogs failed, the technique was changed to a dog-pack approach. The Japanese-American soldiers were then at some risk as targets for the attack dogs. The program was terminated abruptly upon inspection by Army officials from Washington.

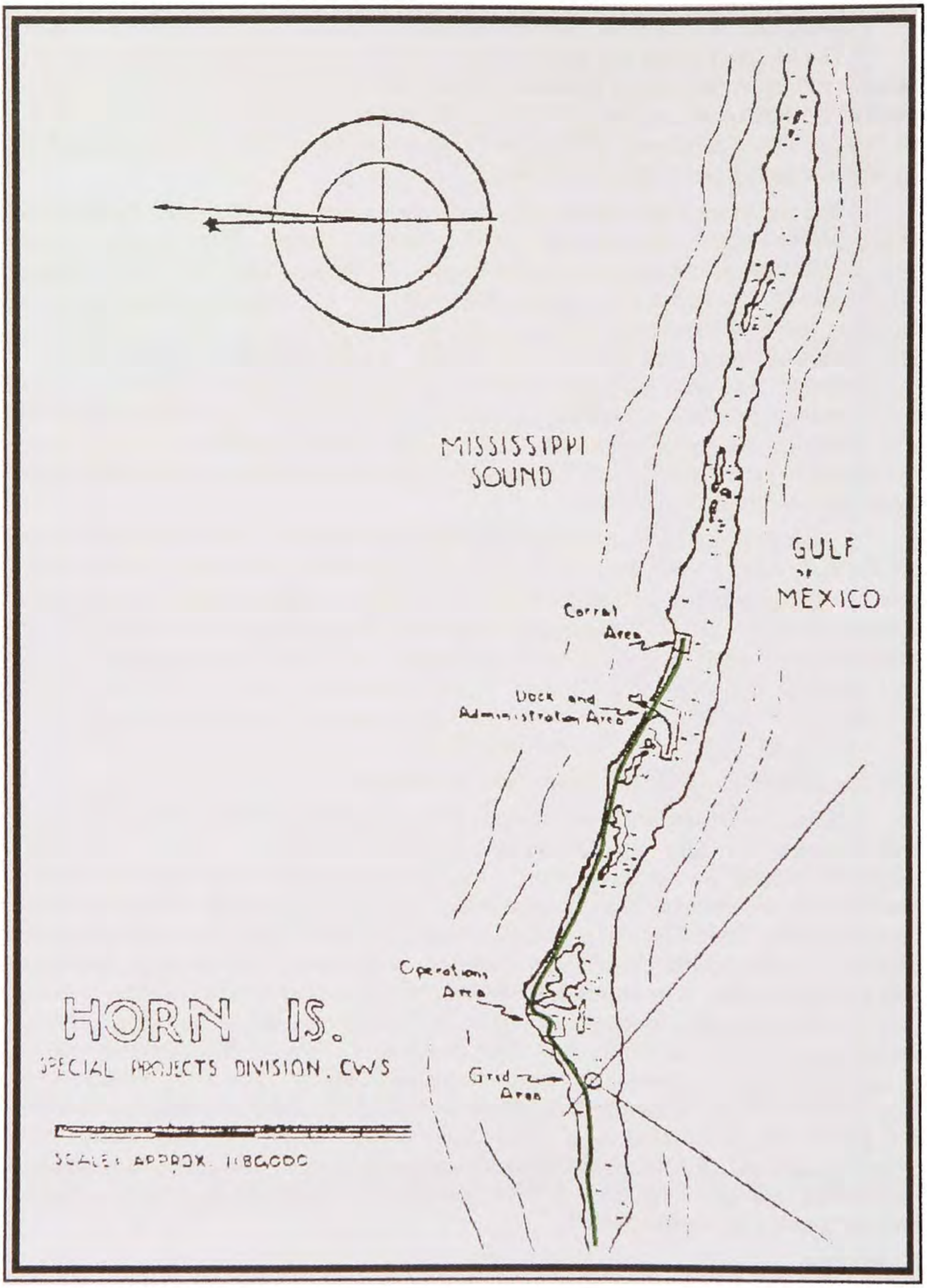
Other dog training continued to take place on the island. When the initial call went out for War Defense Dogs, the American people responded by donating more than 18,000 pets. About 10,000 actually went through the training. Different breeds were trained for different missions. Boxers, for example, were trained for suicide missions. Radio-activated explosives were attached to their necks and the dogs were trained to enter foxholes, where the explosives then would be detonated.[45] Whether this practice was ever used is not known. Cat Island, with its semitropical climate and dense vegetation, at one time was one of the five war-dog training centers for the United States.

Chemical Warfare Service, Horn Island Project

Between October 1943 and November 1945, Horn Island was the site of experiments with biological warfare. The mission was known as the Jackson project. The Corps of Engineers secured the 2,000 acre Horn Island installation at the request of the Chemical Warfare Service. Because there were no roads, a small-gauge railroad was constructed on the island (Map 12-5). The entire system of rails, cars, and engines was shipped from Fort Benning, Georgia, and was installed by a company of Seabees.[46] Unfortunately, Horn Island was soon determined to be unsuitable for chemical warfare experimentation because it was only 10 miles from the mainland. Construction had already begun, however, and it was decided to do limited tests using toxins. The primary project involved testing the effectiveness of *botulinum* toxin as a possible filling for an explosive device. Only a few months after the project was initiated, the main testing ground for biological warfare was transferred to Utah. The project was deactivated on 15 November 1945 and the property was returned to the Corps for disposal. A total of 140 mustard seed bombs were incinerated and buried in an undisclosed location on the island in 1946; the island was decontaminated by the Chemical Warfare Service in August 1946.[47]

Ordnance

War Assets Administration records containing information about disposal of the plants as war surplus constitute the only source of information on ordnance activities in the Mobile District. All ordnance sites in Alabama, for example, eventually were turned over to the Reconstruction Finance Corporation as war surplus.



Map 12-5. Horn Island, Special Products Division, CWS, shwoing the railroad built during the biological warfare research, 1947 (National Archives, East Point, Georgia).

Ammunition was needed critically during World War II, and the nation found itself unprepared when mobilization occurred. Mobile District Engineers were responsible for the design and construction of a number of ordnance works in Alabama, Mississippi, and Tennessee. A major facility at Kingsport, Tennessee, the Holston Army Ammunition Plant (Figure 12-6), is still in operation and produced much of the ammunition for the Vietnam War (Figure 12-7). Three other examples of ordnance construction in the District include the Alabama Ordnance Works, which made smokeless powder, TNT, DNT and tetryl manufacturing plant located near Sylacauga, Alabama; the Coosa River Ordnance Plant which was a bag manufacturing and powder loading plant located near Talladega, Alabama; and Redstone Arsenal, an ammunition loading plant at Huntsville, Alabama. Alabama Ordnance was in operation between 1942 and 1945. Over 20,000 people were involved in its construction, most of them from the greater Birmingham area.[48] The project ultimately had 575 buildings with nearly 2.5 million square feet of space and was scattered over approximately 13,162 acres (Map 12-6).[49] The Coosa River Ordnance Plant, on 5,000 acres, was used to make smokeless powder that was transferred to another location for use in loading ammunition (Map 12-7).[50] Principal facilities, therefore, included magazines for the storage of powder, identified in the WAA prospectus as 132 igloos of the standard type. Each igloo was one story, covered about 2,000 square feet and was of concrete, arch-shaped construction (Figure 12-8). One of the largest single structures on the site was the bag manufacturing plant (Figure 12-9), which covered nearly 90,000 square feet. Redstone arsenal covered 11,636 acres and was used for loading ammunition (Map 12-8). It was designed for the assembly and storage of complete rounds of munitions and component parts.

The Korean Conflict

With the end of World War II, the District found its military responsibilities scaled back considerably as military projects and facilities were deactivated. The District continued to be involved in routine user agency construction work, such as building barracks and support facilities for various bases around the area. Mobile District, however, was not prepared for the onslaught of construction activity brought on by the Korean War. Fortunately, the District had developed the ability to reassign personnel quickly. In addition, many people involved in the new civil works programs had gained valuable experience on military projects during World War II. This meant that expertise for handling nearly any military construction assignment existed within the District's labor pool. This fact gave Mobile an advantage over neighboring Districts that had not coordinated and supervised as much military construction in the recent war. Mobile's chief areas of activity included real estate, rehabilitation of existing structures, and new construction.[51] [52]

One of the first actions by the Real Estate Division was to halt the leasing of all government-owned facilities that might have military usefulness. Negotiated leases at Redstone Arsenal in Alabama and the Milan and Holston arsenals in Tennessee, were revoked as the nation was placed on standby alert. In addition, the Real Estate Division began acquiring new land for military construction. Rehabilitation of existing structures was fraught with problems, mostly associated with normal deterioration. As stated earlier, buildings that were constructed in haste as temporary facilities during the previous war, were greatly deteriorated. In many instances little was salvageable except the site.

The need to rehabilitate buildings was compounded by the early arrival of troops and the stress put on incomplete buildings. Nonetheless, rehabilitation work was accomplished at Fort Benning, Georgia; Fort McClellan, Alabama; Wolf Creek Ordnance

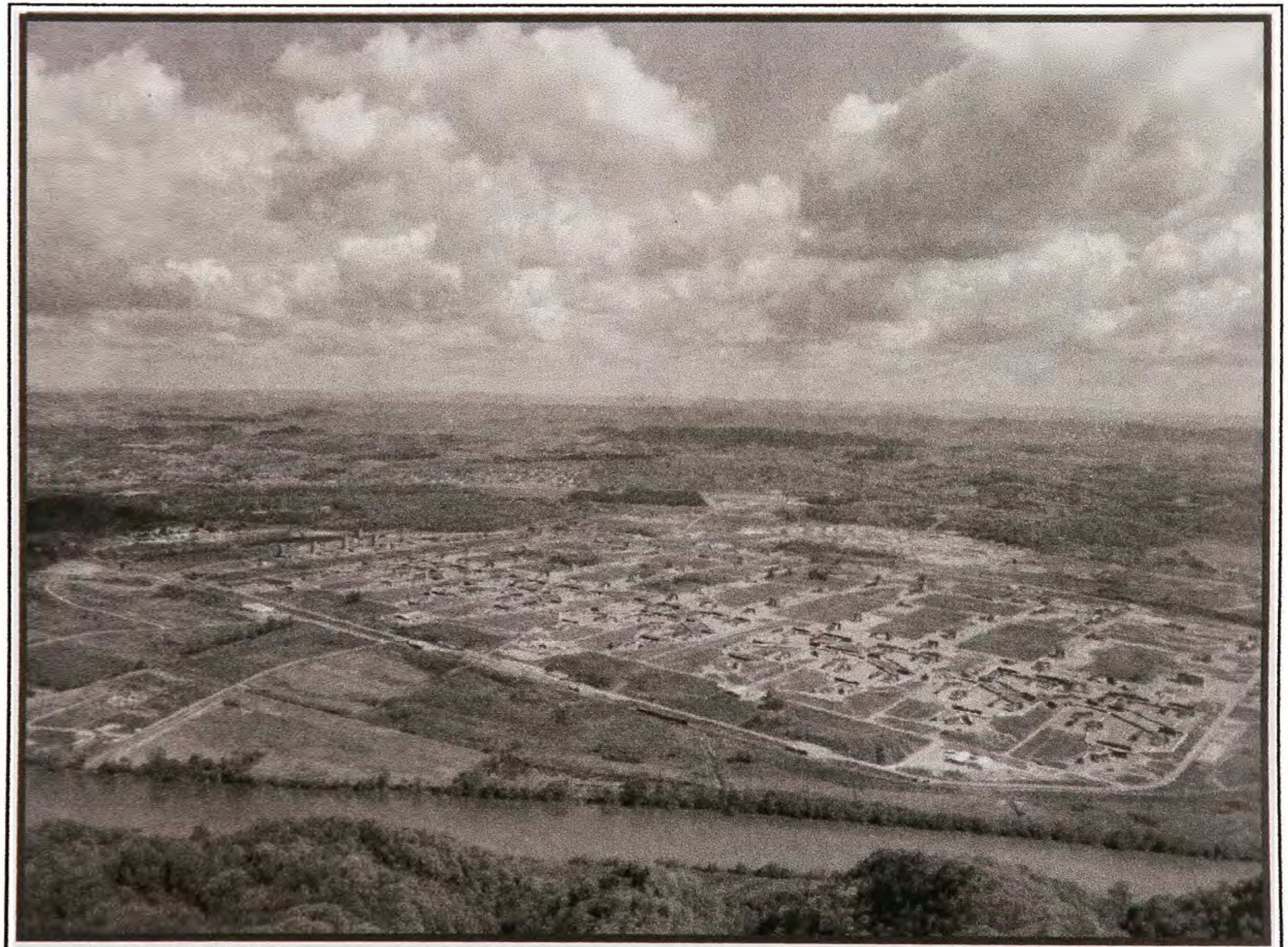


Figure 12-6. Aerial view of Holston Army Ammunition Plant, Kingsport, Tennessee (Public Affairs, MDO).

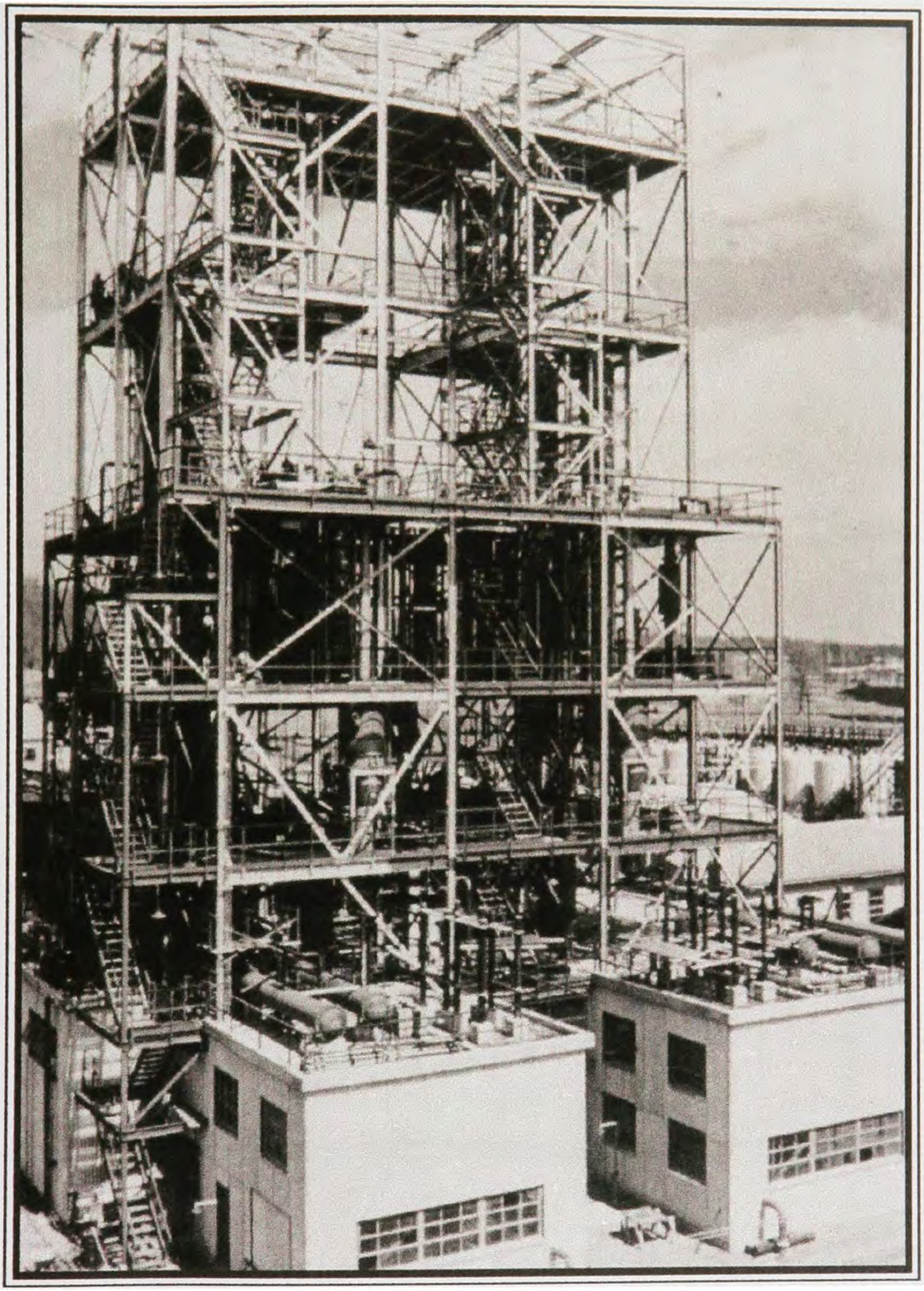
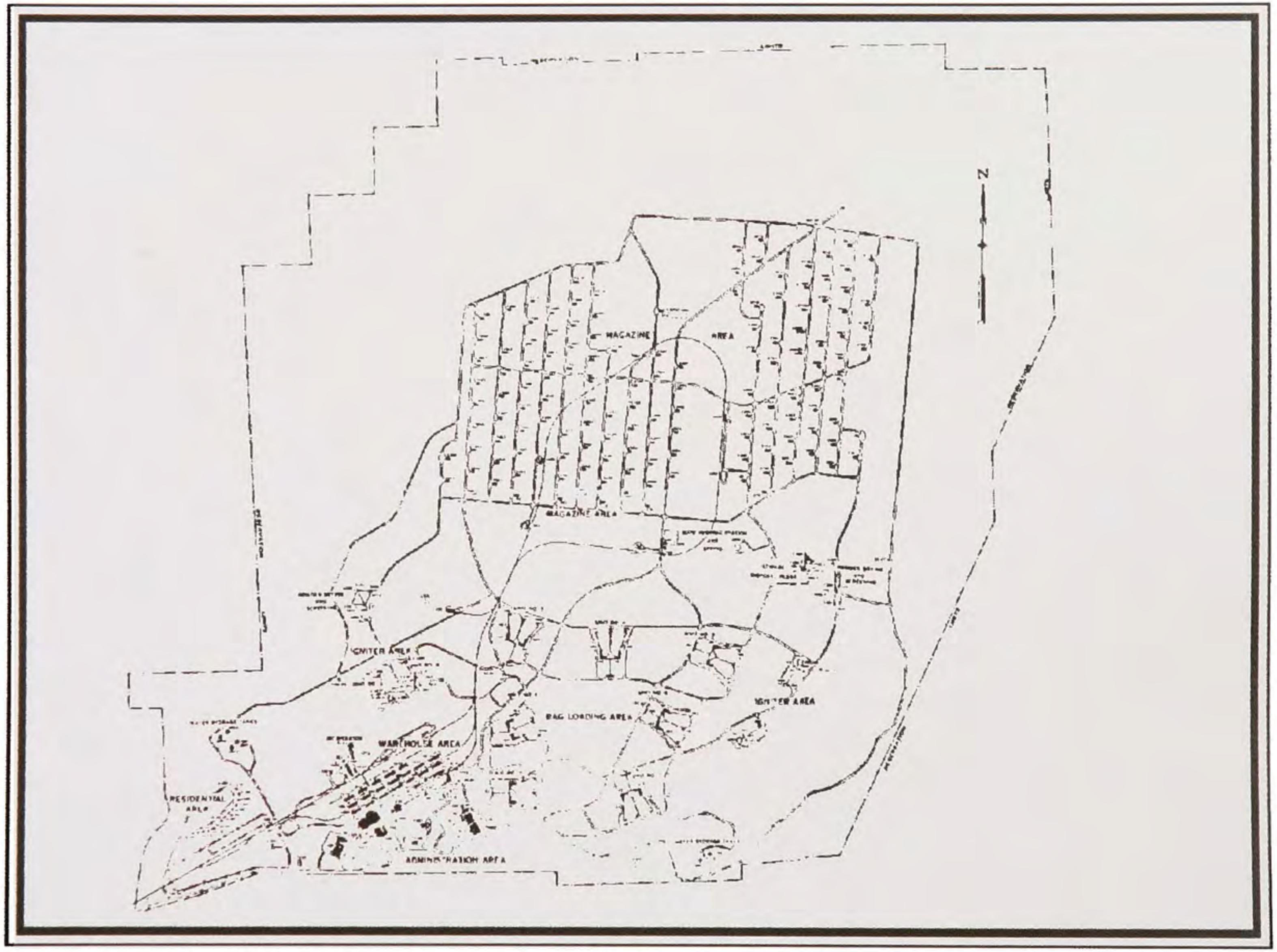
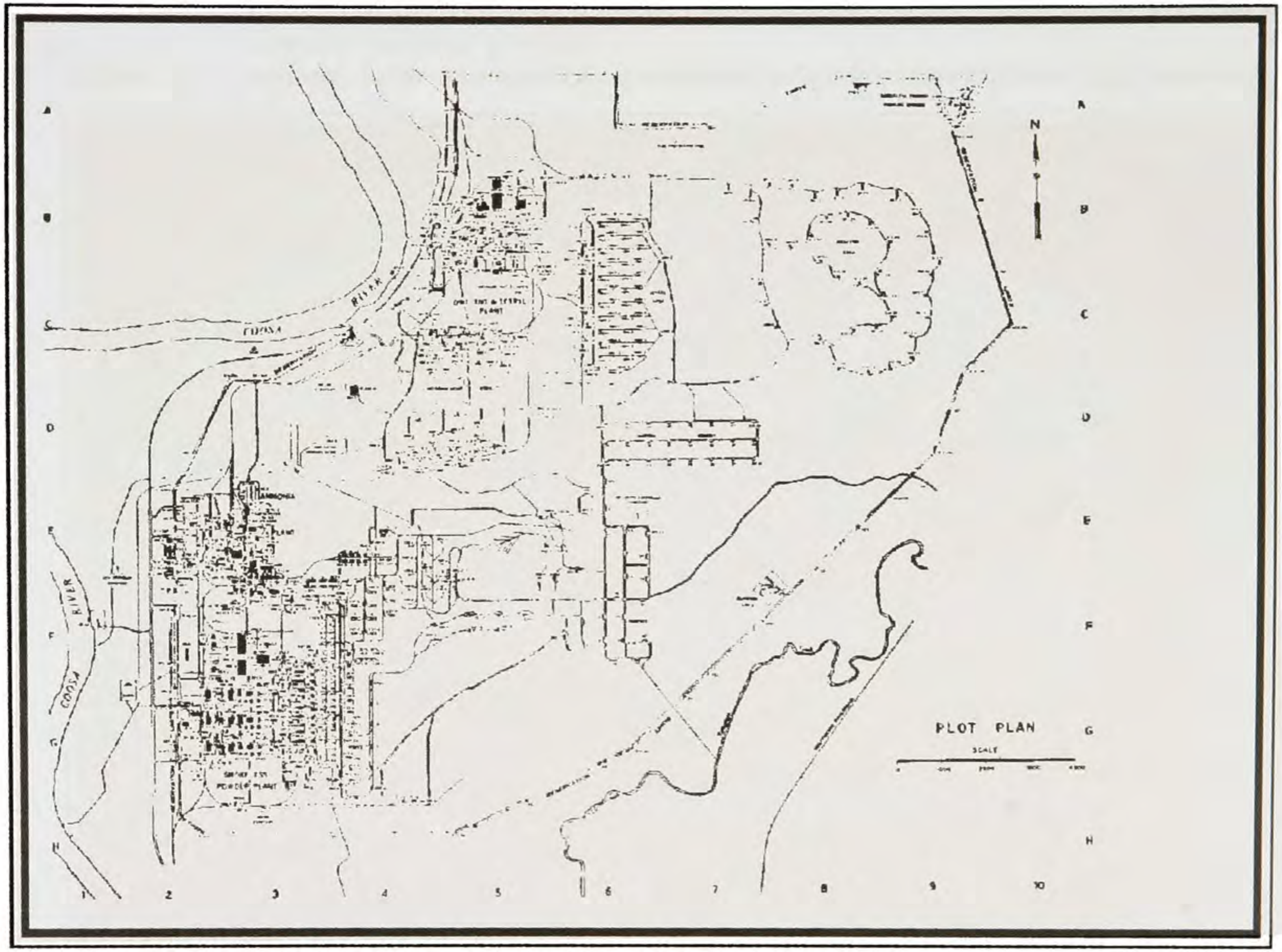


Figure 12-7. Magnesium nitrate facility, Holston Army Ammunition Plant, Kingsport, Tennessee (Public Affairs, MDO).



Map 12-6. Plan of the Alabama Ordnance Works (National Archives, East Point, Georgia).



Map 12-7. Plan of the Coosa River Ordnance Plant (National Archives, East Point, Georgia).

Figure 12-8. Examples of standard ammunition magazines, Anniston Ordnance Depot, 1952 (National Archives, East Point, Georgia).

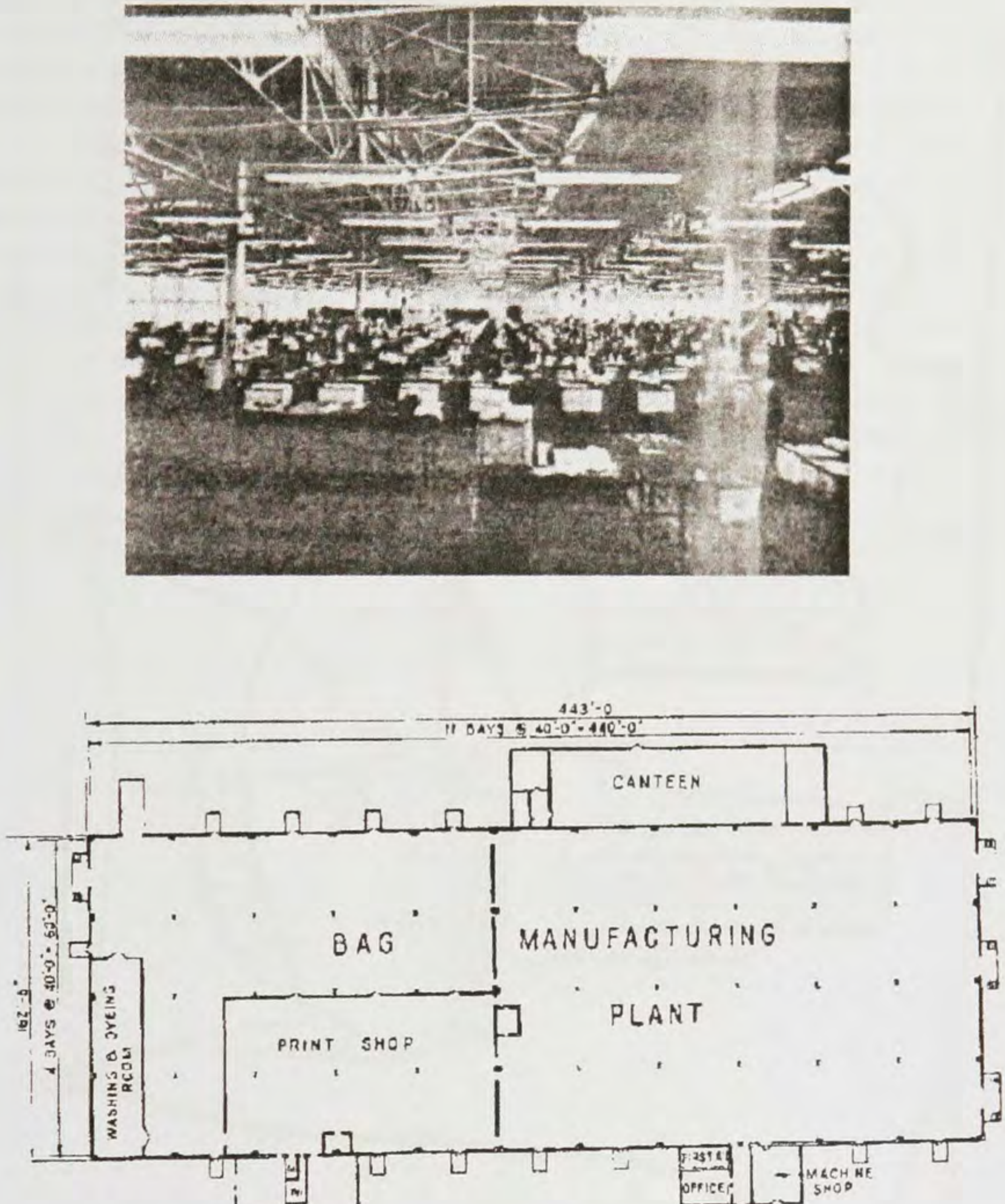
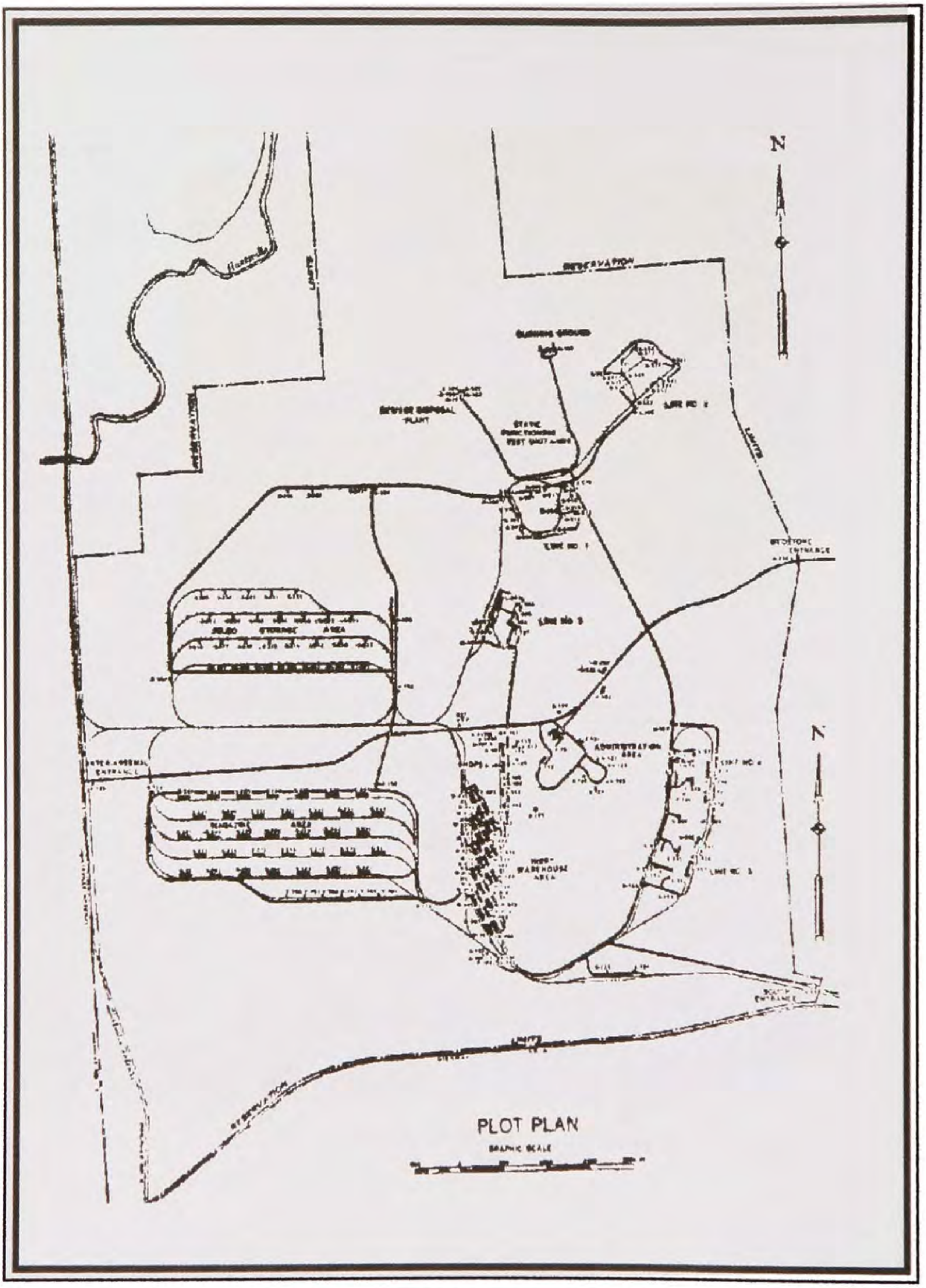


Figure 12-9. Photograph of the interior of Bag Manufacturing Building and a plan of the building, Coosa River Ordnance Plant, Talladega, Alabama, circa 1950 (Federal Records Center, East Point, Georgia).



Map 12-8. Plan of Redstone Arsenal (National Archives, East Point, Georgia).

Plant and Holston Ordnance Works, Tennessee; Camps Gordon and Stewart in Georgia; and at other locations.

The prohibitive cost of rehabilitating some of the old ordnance facilities led to the construction of new ones such as the Anniston Ordnance Depot in 1951 (Figure 12-10). A Remote Receiver and Transmitter Building was constructed at Tyndall AFB, Florida, and equipment was placed at Apalachicola AFB. Coast Guard buildings at Biloxi were renovated, and work was under way on the Veterans Administration Hospital in Birmingham.

The District also was responsible for the design of navigational aids for such Air Force installations as Brookley Field in Mobile, Columbus Airport in Mississippi, Craig AFB in Selma, Alabama, Eglin AFB, and Keesler, Maxwell, and Tyndall AFBs. New work was done at Fort Rucker where improvements were made to Cairns Army Airfield, (at the time the Army's most completely instrumented field) (Figure 12-11), and on Hanchey Army Airfield, which ultimately became the largest heliport in the world (see Figure 12-12). The District also built specialized structures, such as an electronics laboratory at Keesler, new assembly lines at Holston Ordnance Works, and rocket research facilities at Redstone Arsenal.

When the Korean War ended in July 1953, the United States made the decision to maintain military preparedness. New construction accomplished by the Mobile District was permanent, and from then military and civil operations would coexist as a distinct part of the overall structure of the Corps organization. The District had performed well.

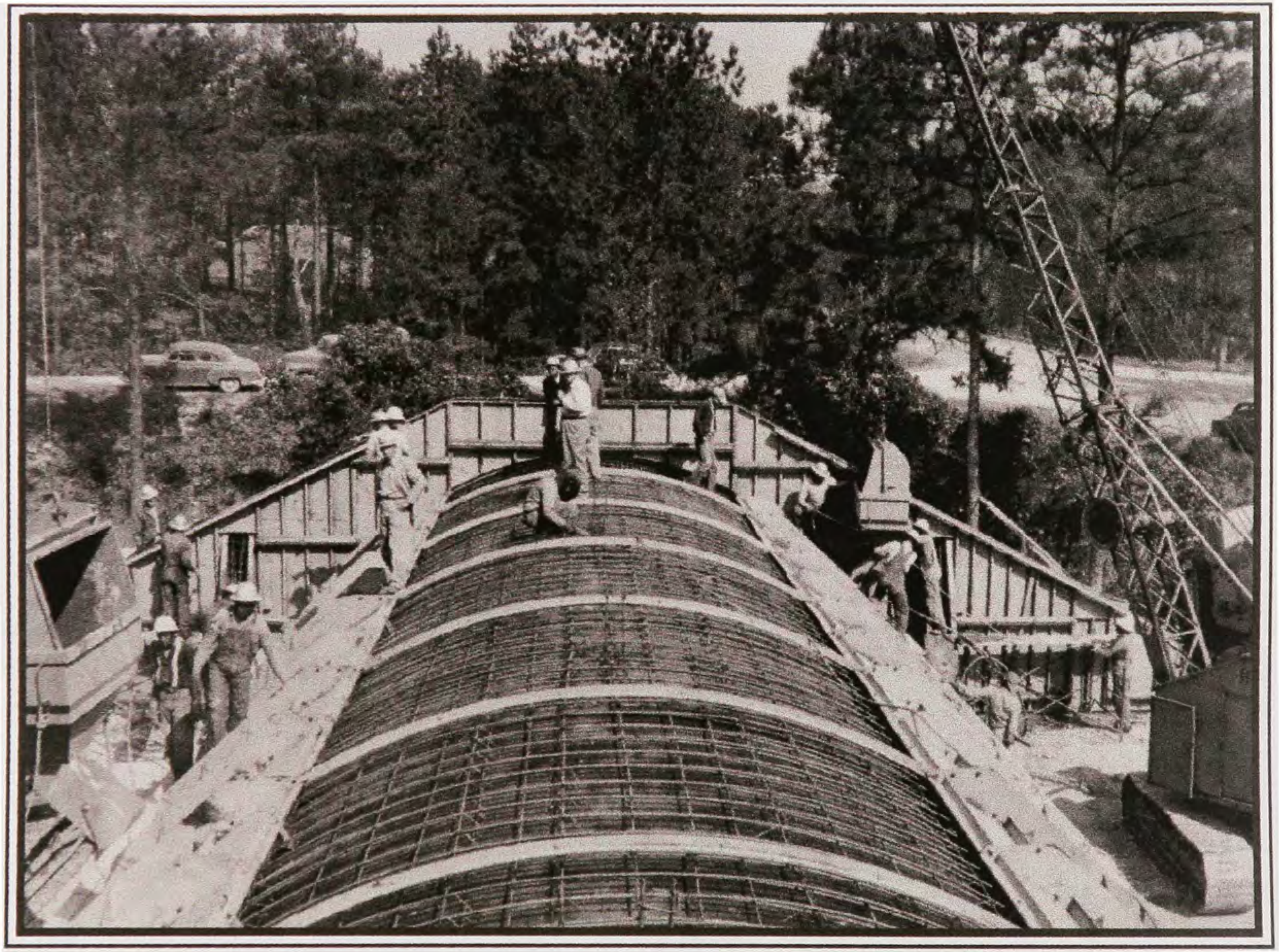


Figure 12-10. Anniston Army Depot, Alabama, 1952 (Public Affairs, MDO).

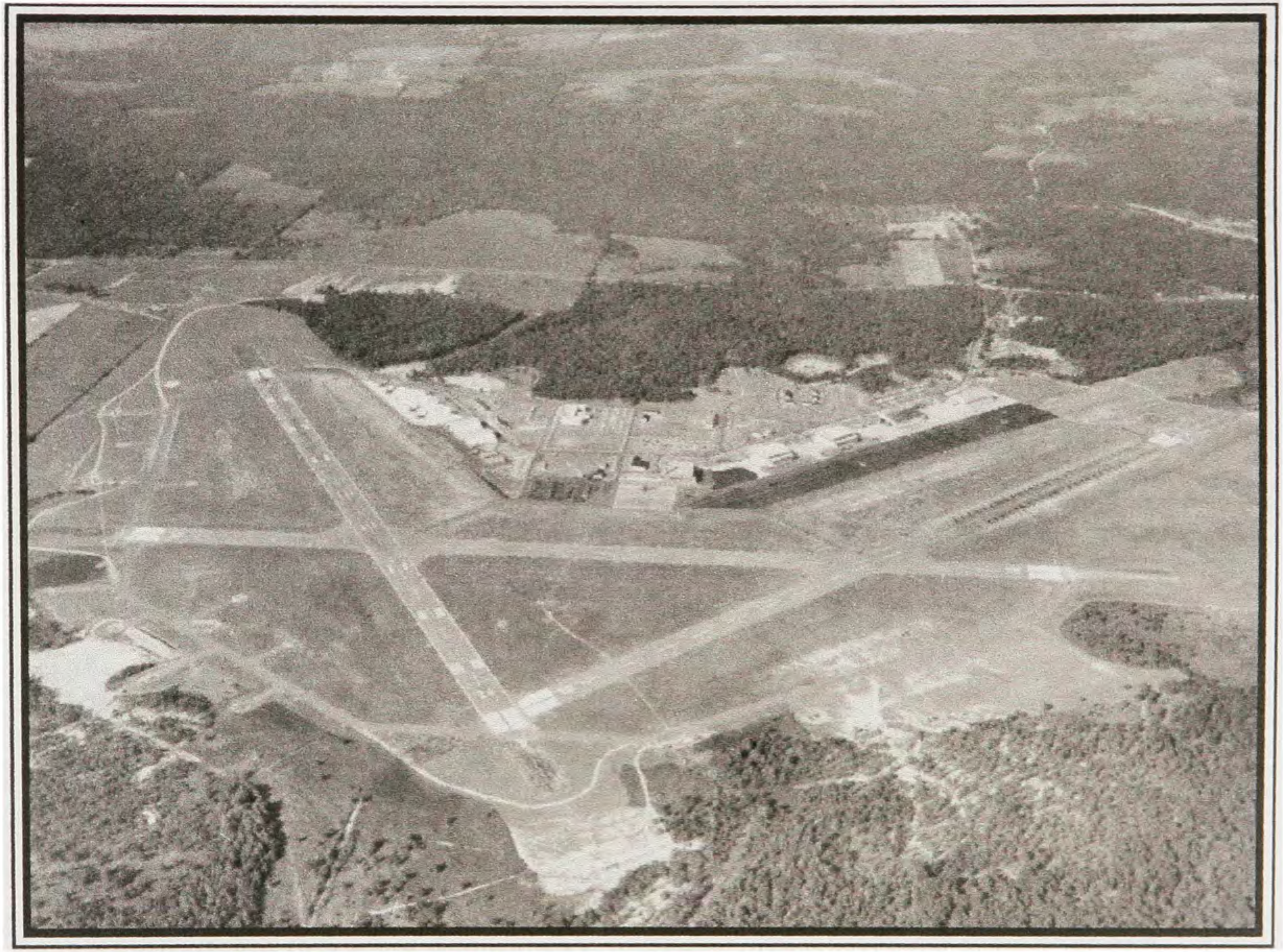


Figure 12-11. Cairns Army Airfield, Camp Rucker, Alabama (Public Affairs, MDO).

Figure 12-12. Hanchey Heliport, Camp Rucker, Alabama (Public Affairs, MDO).

World War II and Its Aftermath, 1940-1955: Notes

1 Knight, *The Mobile District: Reorientation to the Space Age*, pp. 9-10.

2 Ibid., p. 12. Knight appears to be taking his information from another in-house document written by R.L. Saylor, "Historical Sketch of the Mobile Engineer District," 1944. See specifically items 22 and 23. The article has no pagination.

3 Many of the military construction records covering the District's activities in World War II apparently have been destroyed. Records management calls for routine destruction of nonessential files 10 years or older. Records file lists from Kansas City, Suitland, and East Point have yielded no significant leads toward finding Mobile District's records from this period. A few items of nontext value, primarily construction drawings for the Veterans' Administration Hospital in Birmingham and some related phone logs, have been discovered in Administrative Files housed in East Point.

4 *Mobile District History*, p. 68. Davis is cited here because the original documents, supposedly within the Liaison Office, MDO, cannot be located. His figures are confirmed by interviews with retired division chiefs and others, although specific totals could not be recalled.

5 RGs 269 and 270 include records of the War Assets Administration, Federal Records Center, East Point, Georgia. Among those records are shelf lists of real estate disposals of military property including airfields, depots, ordnance works, and other structures. Much of this surplus was disposed of between 1946 and 1949.

6 *Construction in the United States*, p. 131.

7 Ibid., pp. 134-136.

8 Ibid., p. 137.

9 Ibid., p. 444.

10 Notes from a brochure prepared for the Ninth Engineer Officers Advanced Class Tour of Inspection, 1955, p. 237.

11 *Mobile District History*, p. 68.

12 Brochure, Tour of Inspection, 1955, p. 241.

13 Ibid.

14 Interview with L.L. Knight, Chief, Military Branch, (Ret.), Mobile District Office, 9 September 1984.

15 Ibid.

16 Ibid.

17 Ibid.

18 Office of Information (Historian), Headquarters, Air University, Maxwell Air Force Base, AL, *Fifty Years of Aviation History at Maxwell Air Force Base, 1910-1960*, n.d., p. 28.

19 Ibid., p. 35.

20 Ibid., p.36.

21 Dale M. Titler and Gary M. Murphy, *Keesler Field: Inception to Pearl Harbor, 1939-1941* (Keesler AFB, MS: Keesler Technical Training Center, Office of History, 1981), p. 31.

22 Ibid.

23 Ibid., pp. 36-37.

24 Ibid., p. 48.

25 Information on the history of Eglin AFB was provided by Julie Massoni, Chief, Office of History, Eglin AFB. A series of newspaper articles in the *Eglin Eagle* covered the 50th anniversary of the airfield. See "From Landing Patch to Air Proving Ground," *Eglin Eagle*, 15 February 1985, p. 18.

26 Ibid.

27 "Eglin: A Land of Many Climates, *Eglin Eagle*, 3 May 1985, p. 18

28 "Railroading, Lumbering at Eglin," *Eglin Eagle*, 10 May 1985, p. 18.

29 "Doolittle and the Tokyo Raiders: Training," *Eglin Eagle*, 22 March 1985, pp. 6-7.

30 Information supplied by Julie Massoni, Chief, Office of History, Eglin AFB, July 1988.

31 *Fort Rucker Master Plan Phase I Analysis*, July, 1983, p. 2-1.

32 RG 160, Entry 27, Army Service Forces, Mobilization Division, Correspondence File, Fourth Service Command, Series 4, Box 37, *History of Fort McClellan, Alabama*, n.d., p. 3.

33 Ibid., p. 5.

34 Ibid., p. 7.

35 Stanley Hoole, "Alabama's World War II Prisoner of War Camps," *The Alabama Review* (April 1967): 83-114. Unless otherwise noted, this seminal work on the POW camps in Alabama has been paraphrased.

36 Knight interview.

37 RG 270, Records of the War Assets Administration, Real Property Classification, 18 January 1946.

38 Randy Wall, "Inside the Wire: Aliceville and the Afrika Korps," *Alabama Heritage*, 7 (Winter 1988), p. 5.

39 Ibid.

40 RG 270, Records of the War Assets Administration, Letter dated 25 August 1948 from Thomas L. Payton, Director, Non-Industrial Division of WAA to T.A. Dechman, Regional Director.

41 RG 270, Records of the War Assets Administration, Letter dated 27 May 1949 to WAA, Non-Industrial Division, from B.L. Blach, Superintendent, Macon County, AL.

42 RG 270, Records of the War Assets Administration. Box 91 contains a number of documents and maps relating to the disposal of the Opelika Camp. The city and the Opelika Foundry Company disagreed about the authenticity of the bid, whether the bid was handled appropriately, and other related correspondence. This typical the governments problems in disposing of surplus property after the war.

[43] Ben Tamashiro, "A Bastard Outfit - What Else?" *Puka-Puka Parade*, No. 1 (January-February 1980): 11.

[44] Yasuo Takata and Raymond Nosaka, "The Secret Mission of the Third Platoon, Baker Company," *Puka-Puka Parade*, 34, No. 2 (March-April 1980): 21.

[45] Kate Bergeron, "U.S. Dogs Once Trained on Cat Island," *The Sun/The Daily Herald*, Mississippi Gulf Coast, May 10, 1981, p. A-14.

[46] Reymond C. Cochrane, "Biological Warfare Research in the United States," in *History of the Chemical Warfare Service in World War II* (1 July 1943 - 15 August 1945), Report, Historical Section, Plans, Training and Intelligence Division, Office of the Chief, Chemical Corps, November 1947, n.p. This document was supplied by the History Office, Keesler AFB, Mississippi.

[47] Jon Frank, "Army Reveals Horn Island Was Mustard Bomb Disposal Site," *The Sun/Daily*, Mississippi Gulf Coast, 23 January 1983.

[48] RG 77, General Administrative Files, Box 43, Item 682, "Survey and Estimate of Alabama Ordnance Work, Sylacauga, Alabama, Army Contract No. DA-11-178-ORD-345, Kimberly-Clark Corporation," 1953, p. 2.

[49] RG 270, Box 43, Records of the War Assets Administration, Federal Archives, East Point, GA. Prospectus showing availability and disposal information through Reconstruction Finance Corporation, n.d.

[50] Ibid., Box 76.

[51] *Mobile District History*, p. 71.

[52] Complete data on military construction projects for the Mobile District during the Korean War and for World War II cannot be found. A series of letters and memos found in the General Administration Files, 1951-1952, RG 77, in the Mobile District Office indicate the magnitude of work that was being accomplished around the district and for user agencies in the Military District.

XIII. The Aerospace Age, 1955-1985

Events in World War II led directly to Mobile District's involvement in the guided missile program and from there into design and construction responsibilities for a number of related aerospace projects. The 1950s and 1960s were periods of experimentation, research, and development of ballistic missile defense (BMD) systems. An offshoot of BMD research was the research and development associated with the Saturn rocket and the U.S. space program. Thus, the 1960s and early 1970s saw the Mobile District involved in an array of projects associated with putting man on the moon. Through the enormous projects required to put the United States at the forefront of nuclear defense technology and space technology, the Mobile District developed an expertise in military engineering. Among the more important projects are the Nike missile program, work for the National Aeronautics and Space Administration, and the sophisticated rocket testing facilities developed for the U.S. Air Force.

The Ballistic Missile Defense Program

Mobile District's link with the Army ballistic missile defense program was through Redstone Arsenal in Huntsville, Alabama. Until its designation as a separate Engineer District in 1967, Huntsville's operations were part of the Mobile District. Redstone Arsenal is one of eight permanent Ordnance Corps units in the United States and is the only one devoted exclusively to the research and development of missiles. It was established in 1941 and was adjacent to the Huntsville Arsenal for a number of years; the two arsenals were constructed at a cost of nearly $90 million. During World War II, the Huntsville Arsenal manufactured and loaded shells while Redstone assembled explosives for them and produced rounds. With demobilization following World War II, the demand for the arsenals' products dropped sharply. Although the Huntsville ammunition works (called the Redstone Arsenal by the Reconstruction Finance Corporation) was declared surplus, the two operations were consolidated in 1948 as Redstone Arsenal.

In July of that year the Ordnance Rocket Center was placed at Redstone. In 1950, Wernher von Braun and his associates, the most noted rocket scientists in the world, moved to Huntsville with the guided missile research and development facilities previously situated at Fort Bliss, Texas (Figure 13-1).[1] In 1956, the Army Ballistic Missile Agency was established at Redstone, and in 1958 the U.S. Army Ordnance Missile Command was established to consolidate and simplify Army missile work. The rapid succession of events at Redstone from 1948 to 1958 typified the revolutionary changes taking place in missile technology following World War II. Mobile District Engineers were responsible for the massive construction program called for by all of the changes taking place.

Liquid fuel rocket research, particularly in Germany, had caught the attention of American military personnel. Just how far German research had progressed was dramatized when the V-2, a liquid fuel rocket, was fired on Paris on 6 September 1944. Within two days, London was struck by a terrifying barrage of these deadly rockets that continued until near the war's end.[2] The intercontinental ballistic missile had become an operational reality. The defection of von Braun and other noted German scientists to the United States gave the military establishment a moral and technological advantage following the war.

The emergence of the V-2 system presaged the possibilities, and consequences, of combining the power of the atomic bomb with a missile delivery system. Both Americans and Soviets recognized that such a combination could produce the ultimate weapons system, and the arms race was on. The complacency of America's military leadership dissipated in

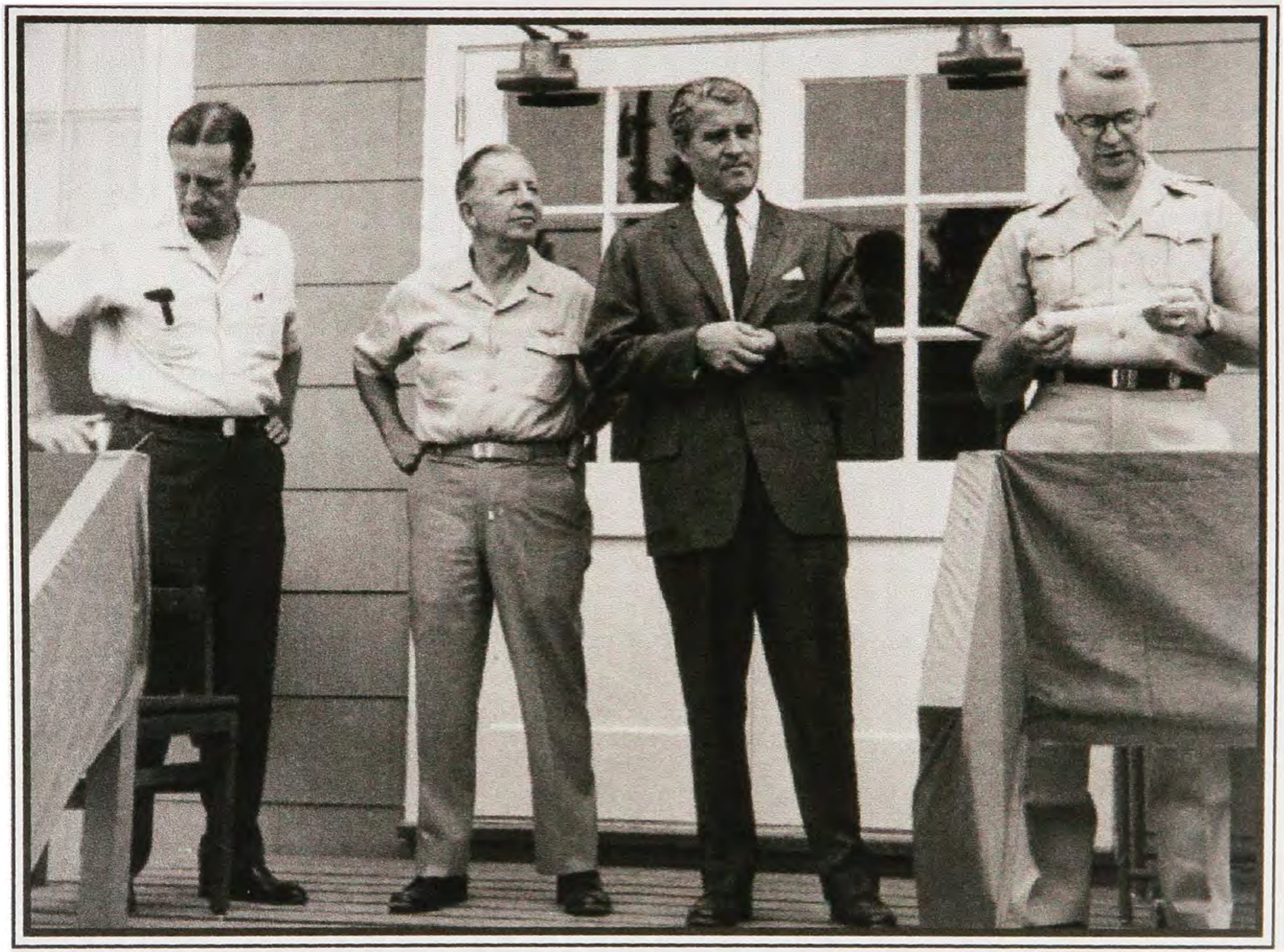


Figure 13-1. Photograph of Wernher von Braun (in suit), Redstone Arsenal, Alabama (Public Affairs, MDO).

the late 1950s when the Soviet Union stunned the scientific world with the launching of the first spaceship. In addition, the U.S.S.R. had successfully fired a crude ICBM in August 1957 (the first successful American ICBM was not fired until December 1957).[3]

A major development in ballistic missile research occurred shortly after the war as a result of the Nike project. Research began in 1945 on a mechanism for controlling the flight of ICBMs in order to make them interceptors. Success with the early program produced the Nike-Ajax, a radar-directed anti-bomber missile. It was superseded by a second-generation model called the Nike-Hercules, similar to its predecessor but nuclear tipped. The "Shrimp" shot of 1954 demonstrated that the hydrogen bomb warhead could be joined to an ICBM without drastic redesign; the new knowledge revolutionized the ICBM program.

In 1957, a design proposal was developed for the first true anti-missile system, to be called Nike-Zeus. The Secretary of Defense placed the Army in charge of most of the nation's air defense missiles in 1958, and the Army Ordnance Technical Committee authorized Zeus as a full-scale developmental program later that year. Within the next four years the world's first workable anti-ballistic missile (ABM) system became a reality.[4]

Because of the Army's responsibility for missile defense and the design expertise developed within the Mobile District, Mobile was called on to design and construct the various facilities that would to be needed. At Mobile, the Zeus project came under the Special Defense Projects Section. Test facilities were constructed for the project and these stretched from Ascension Island in the South Atlantic to Kwajalein Island in the Pacific.[5] An intercept site was built with radar and other sophisticated tracking equipment. Success of the operation was confirmed on 19 July 1962 when a Zeus fired from Kwajalein Island intercepted an Atlas-D ICBM fired from Vandenburg AFB, California (4,800 miles away).[6] The interception marked a milestone in the evolution of the entire system, and Mobile District played a key role from the start.

Following the success of the Zeus project, research and development continued on the Nike project. Additional missile projects, such as the Nike-X, also were developed. As sophistication continued to increase, a viable BMD system appeared possible. Research involved the development of super radar systems, and the possibility of placing them in concrete buildings for protection against nuclear fallout. The Mobile District, along with the Advanced Technology Branch of the Corps in Washington, D.C., was called on for this part of the project.[7] Through the mid-1960s, the Nike-X Project Office at Redstone Arsenal worked to develop a series of plans for the mass production of the system. On 2 December 1966, the Corps was assigned the awesome responsibility for design and construction of the Nike-X facilities should the system be deployed.

The Huntsville Division resulted from the reorganization that came about when the Nike-X program was deployed in 1967.[8] A plan had already been developed to establish a separate organization just to handle the BMD system deployment. Many of the people in Mobile's Special Defense Projects Branch knew they would be reassigned.[9] They became the nucleus of the Huntsville Division.

The Saturn Project

The construction of facilities for the Saturn project, a rocket program that was the work of the von Braun team at Redstone, was one of the Mobile District's biggest projects. The Saturn super booster, however, was a larger rocket than either the Army or the Air Force could realistically use. Because the civilian space program could make use of it, NASA assumed responsibility for the super booster in late 1959.[10] As a consequence, the Army

Ballistic Missile Agency's Operations Division was transferred to NASA. It is through this agency that the Mobile District became involved in the space program. NASA set up a new organization at Redstone that was housed in the George C. Marshall Space Flight Center, the largest single NASA agency. The Mobile District was responsible for the testing facilities at Redstone Arsenal associated with the Saturn booster, and eventually for one of the major District projects of the post-Korean War period, the Mississippi Test Facility (MTF).

Redstone Arsenal

A number of important structures were constructed to handle the testing of the Saturn rocket. One of the first structures was the Saturn V test tower (Figure 13-2). The tower was used to test fire the first stage of the rocket, the same rocket that would be used to carry American astronauts to the moon. The tower was 405 feet high and 160 feet square at the base. The Saturn V rocket produced a 7.5-million-pound thrust, 5 times the thrust of the Saturn I rocket (Figure 13-3).

Other rocket research and testing occurred as well, including development of the "Redstone," an intermediate range ballistic missile (IRBM) with a range of 1,500 miles that was being considered as a spaceship prototype (Figure 13-4). A static test tower was constructed to facilitate the development of this rocket (Figure 13-5). Sophisticated testing facilities were fabricated for additional tests associated with the space program, such as the dynamic test start tower that monitored the effects of shaking during rocket propulsion (Figure 13-6).

Mississippi Test Facility

By 1960, NASA had chosen two additional sites for various operations of the program: the Manned Spacecraft Center in Houston, Texas, for astronaut training; and the Kennedy Space Center at Cape Canaveral, Florida, for launching. The new sites were considered for rocket testing also (preliminary testing at Huntsville proved too disruptive to population concentrations). Noise pollution and occasional window breaking indicated that testing of progressively larger rockets would not be feasible.

The Michoud Assembly Facility in New Orleans, Louisiana, was a major support facility for the Marshall Center. As rocket boosters were assembled at Michoud, the need became clear for a nearby test site, and one that could take advantage of water transportation.

On 25 October 1961, NASA announced that it had selected a location approximately 40 miles northeast of the Michoud Assembly Facility. The Mississippi Test Facility site was largely in Mississippi with a small portion in St. Tammany Parish, Louisiana. The test facility covered an area of 217 square miles along and adjacent to the East Pearl River between Bay St. Louis and Picayune, Mississippi. It would have two zones: an inner zone approximately 5 square miles where the actual rockets would be fired and an outer zone of 212 square miles to serve as a buffer zone around the test firing site. All existing structures would be removed and no one would be allowed to remain on the test facility site. However, people would be allowed to farm and to graze cattle, and companies could harvest timber (Figure 13-7).

The real estate, engineering, and construction responsibilities for the MTF were assigned to the Mobile District. From 1961 until 1966, when the unit became operational, the District was continuously involved in developing the site. After 1965, Mobile's responsibility tapered off until it was phased out around 1970.[11] Between 1965 and 1970 District employees performed such routine "housekeeping chores" as digging wells, laying water lines, and constructing or repairing a vehicle repair shop and other maintenance buildings.

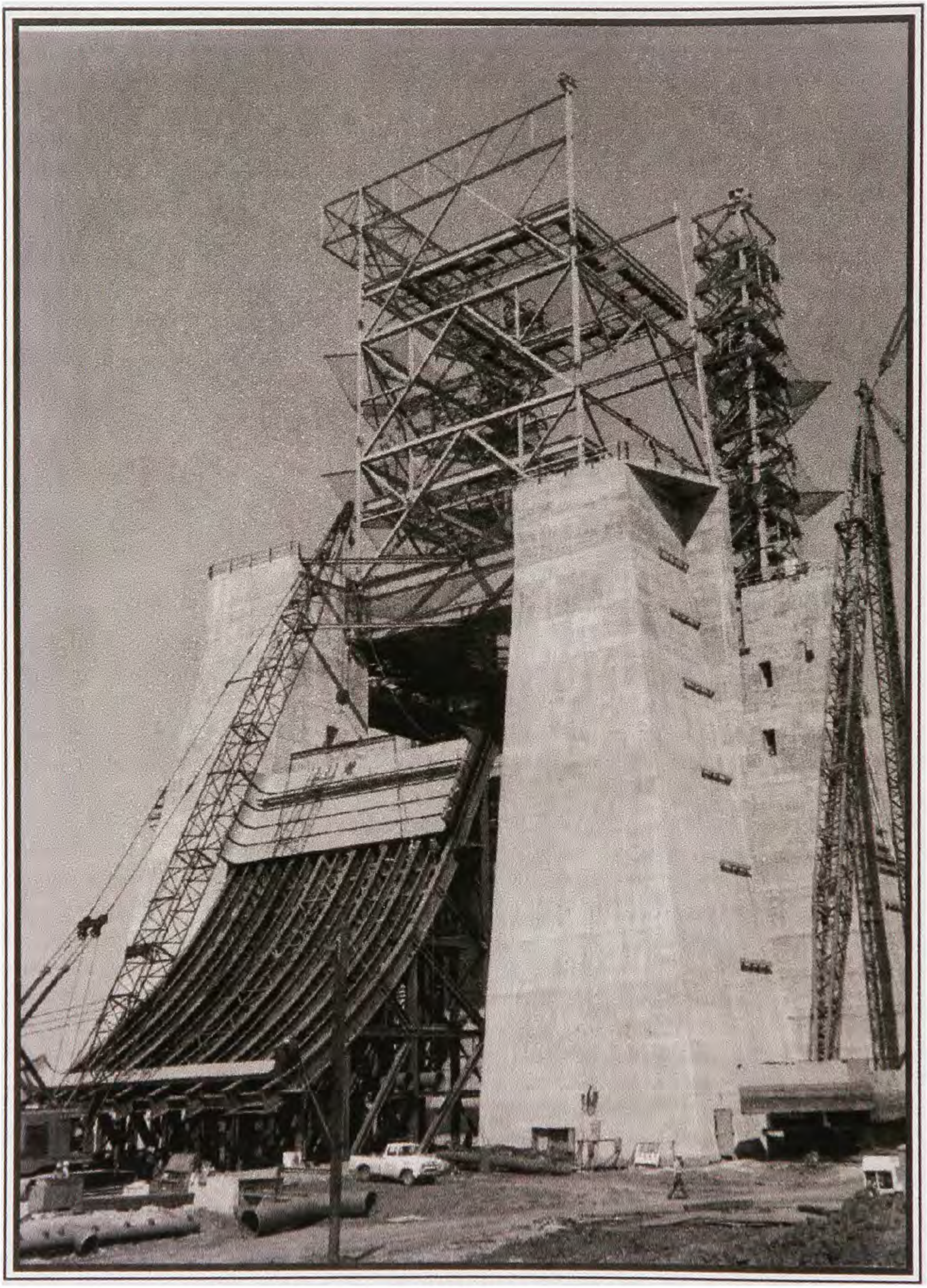


Figure 13-2. The Saturn V test tower, Marshall Space Flight Center, Huntsville, Alabama (Public Affairs, MDO).

Figure 13-3. Test firing the first stage of the Saturn V rocket, Marshall Space Flight Center, Huntsville, Alabama (Public Affairs, MDO).

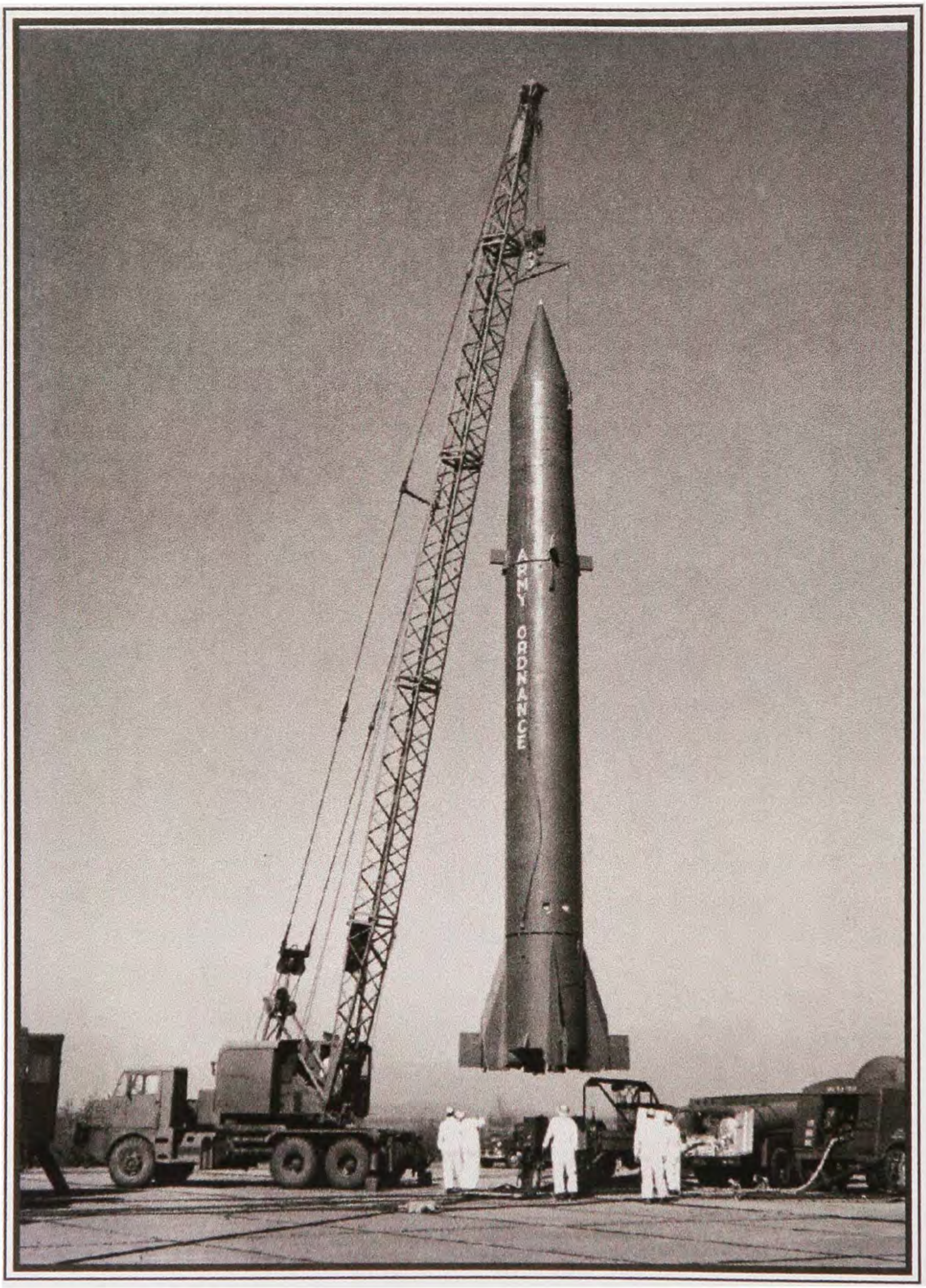


Figure 13-4. An IRBM at Redstone Arsenal, Huntsville, Alabama (Public Affairs, MDO).

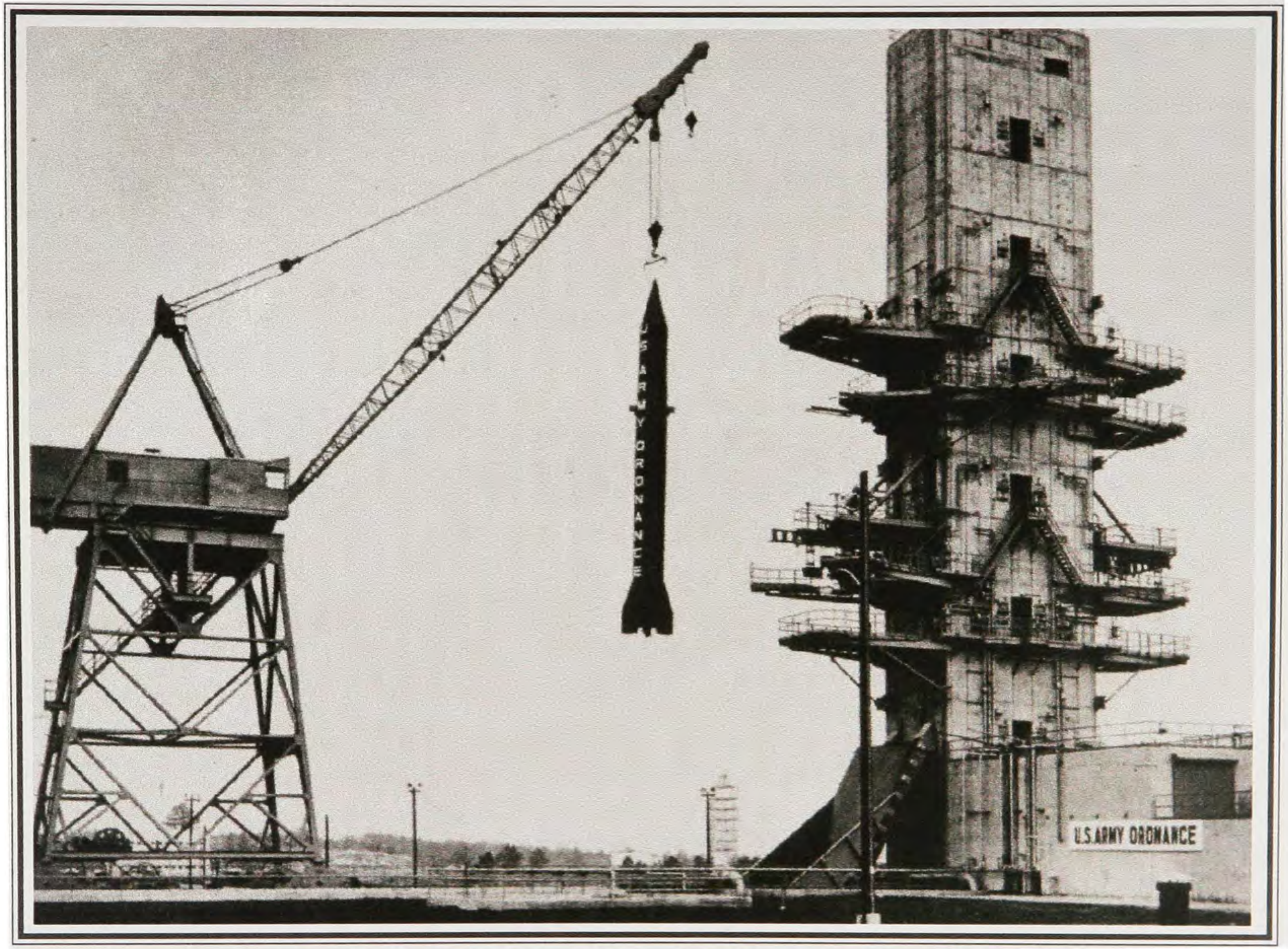


Figure 13-5. A static test stand, Redstone Arsenal, Huntsville, Alabama used to test IRBM (Public Affairs, MDO).

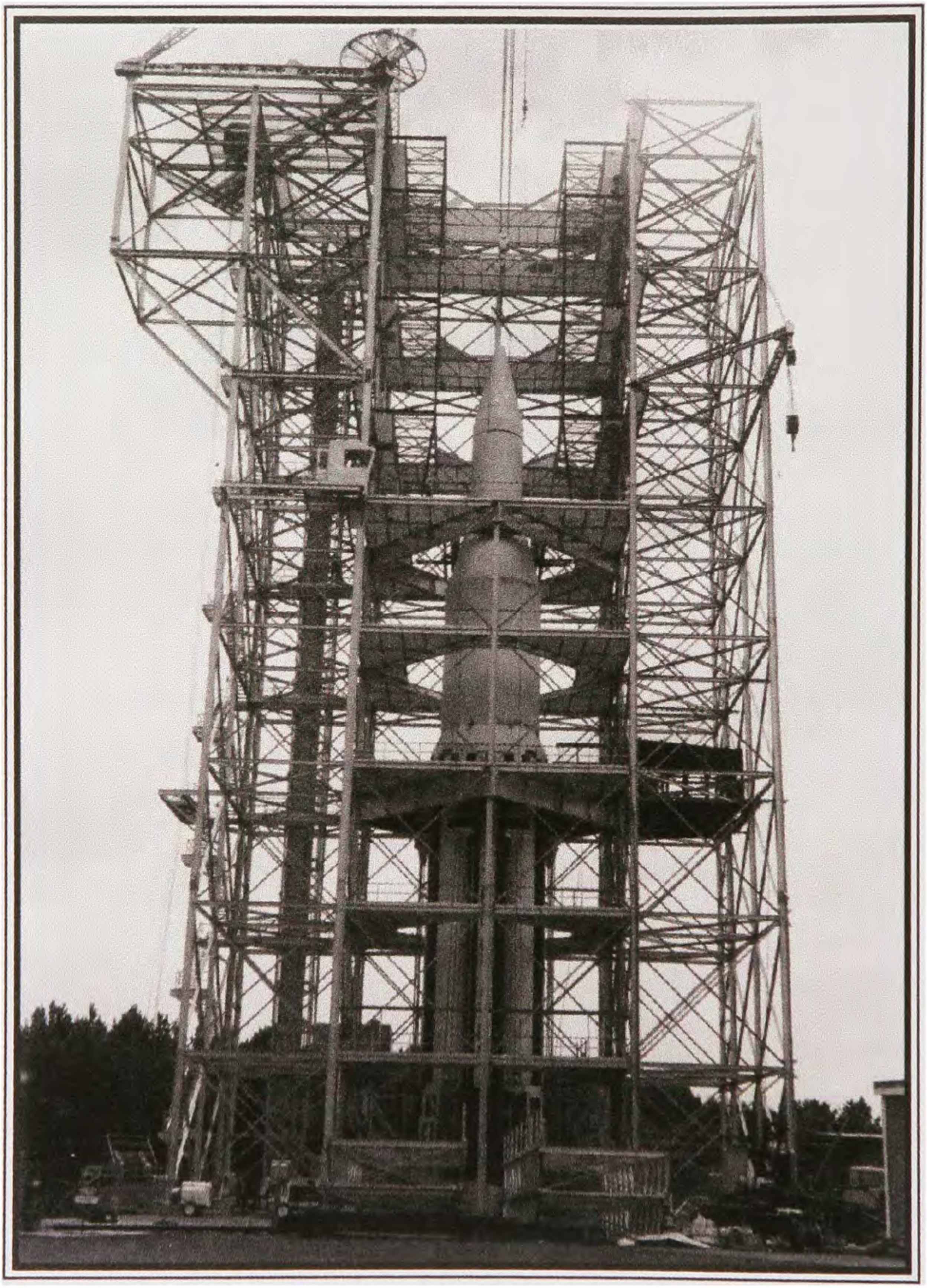


Figure 13-6. A dynamic test start tower, Marshall Space Flight Center, Huntsville, Alabama (Public Affairs, MDO).

Figure 13-7. Mississippi Test Facility. a contrast of technology (Public Affairs, MDO).

Unlike circumstances with other space-related projects involving Mobile, all land for the MTF was newly acquired. The Real Estate Division embarked on a land-acquisition program. Although public attitudes toward NASA and America's space program were generally very favorable in the 1960s, the process was not trouble free (some difficult decisions had to be made and there were over 700 court-contested condemnations). Overall, however, land acquisition for the site progressed smoothly between January 1962 and the closing of the real estate office in Bay St. Louis in late 1965.[12]

During the land-acquisition process, one of the most difficult decisions the Corps had to make was that of ending the life of Gainesville, a Mississippi community that was a former county seat and commercial center in the nineteenth century. The irony was that this town had declined as railroad interests shifted to more lucrative routes; after the community's demise the railroad returned. A Southern Railway branch line from Nicholson, Mississippi, was constructed to bring supplies to the new test site's first construction project, the Gainesville Lock.

One of the first projects was a canal system (Figure 13-8). The need for a water connection with Michoud was a major design requirement because the huge rocket boosters had to be barged to the test facility. The lock operation covered 180 acres; the Saturn boosters entered the canal from the East Pearl River (Figure 13-9) and were carried to the test site where large cranes lifted them onto the firing stands (Figure 13-10). After the canal was dug, water to fill it was pumped overland from the Pearl River via a system of low head pumps, a technique cheaper than constructing a reservoir.[13] Because the MTF Lock is similar in design and dimension to the Demopolis Lock on the Tombigbee, plans for the Demopolis Lock were adapted for the test site. The community of Gainesville was reborn as a port and railroad juncture, but in a new age for a new purpose.

Gainesville was not the only town affected by the development of the MTF. Other towns that disappeared were Log Town, Napoleon, Santa Rosa, Westonia, Flat Top, and Bayou La Croix. Some private estates held by the same families for over a century were relinquished. Though not an historic property, the retirement home of Colonel and Mrs. John A. Wheeler in Napoleon was one example. The gardens of Parade Rest, as the home was called, were one of Mississippi's major tourist attractions. The gardens, along with an historic wisteria bush in Gainesville, were preserved.

Other public properties such as schools, churches, and cemeteries were affected. Several large cemeteries were removed from the five-square-mile test site. Cemeteries and churches in the buffer zone could remain, though concerns were voiced about maintenance because people could no longer live in the area. Most churches resolved these issues without Corps involvement.

In addition to purchasing real estate, clearing the site of people and structures, and constructing a transport canal and water system to support it, several testing stands were constructed at the MTF. Test firing was a simulation of the same phenomenon witnessed at Cape Canaveral when spacecraft were launched (Figure 13-11). Stands were erected not only to hold the huge rockets (some as large as 81 feet high and 33 feet wide), but also to hold the rockets in place while firing. Special deflectors were built, and cooled under water pressure, to avoid the steel melting and running like water.[14]

Arnold Engineering Development Center

As the major builder for the U.S. Air Force, Mobile District was involved in construction of the engineering research facilities at the Arnold Engineering Development Center (AEDC) in Tullahoma, Tennessee, since the early 1960s (Figure 13-12). AEDC is the wind tunnel and propulsion system test cell center for the U.S. Air Force Systems Command.

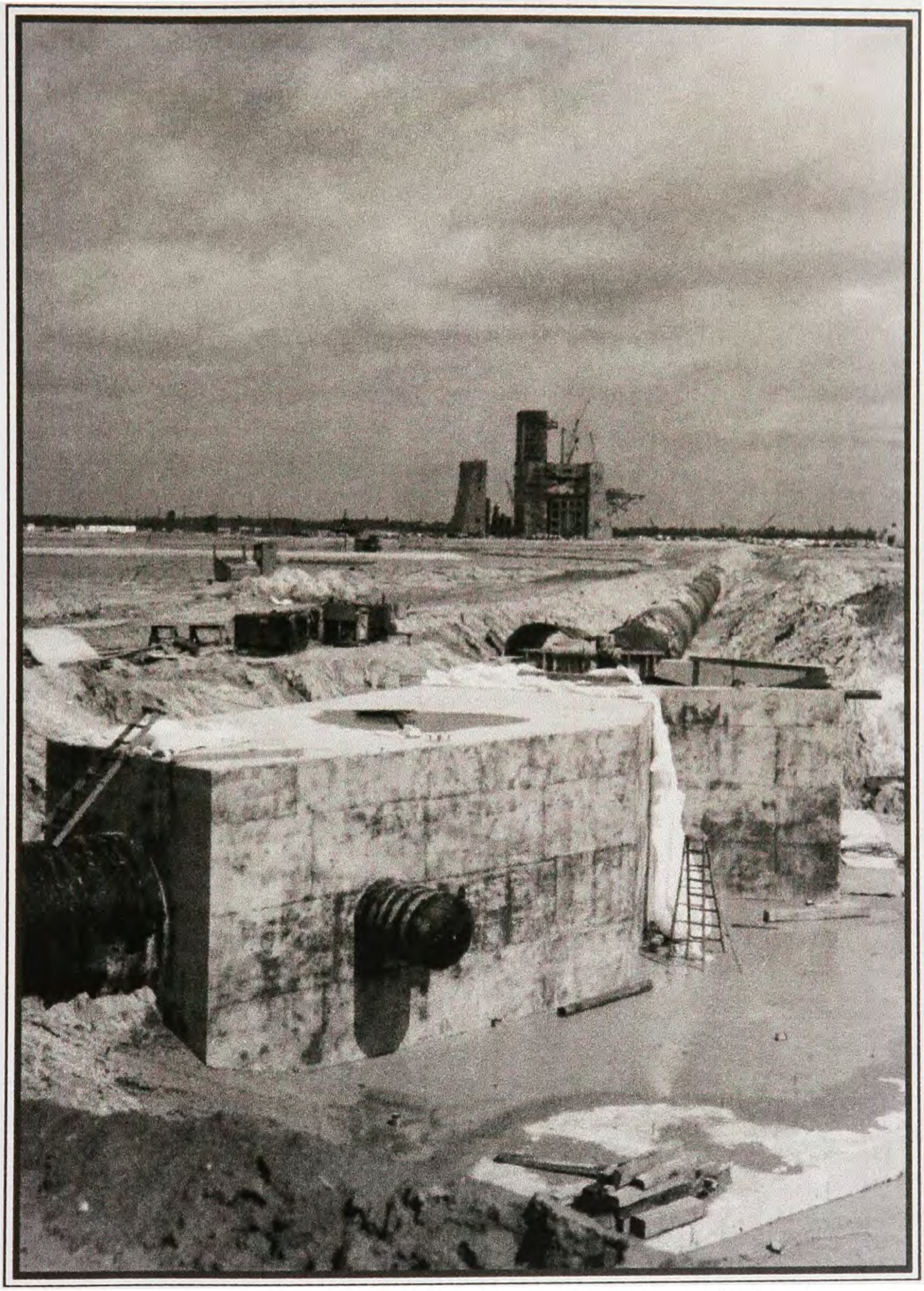


Figure 13-8. Excavations at MTF for the first test stand (Public Affairs, MDO).

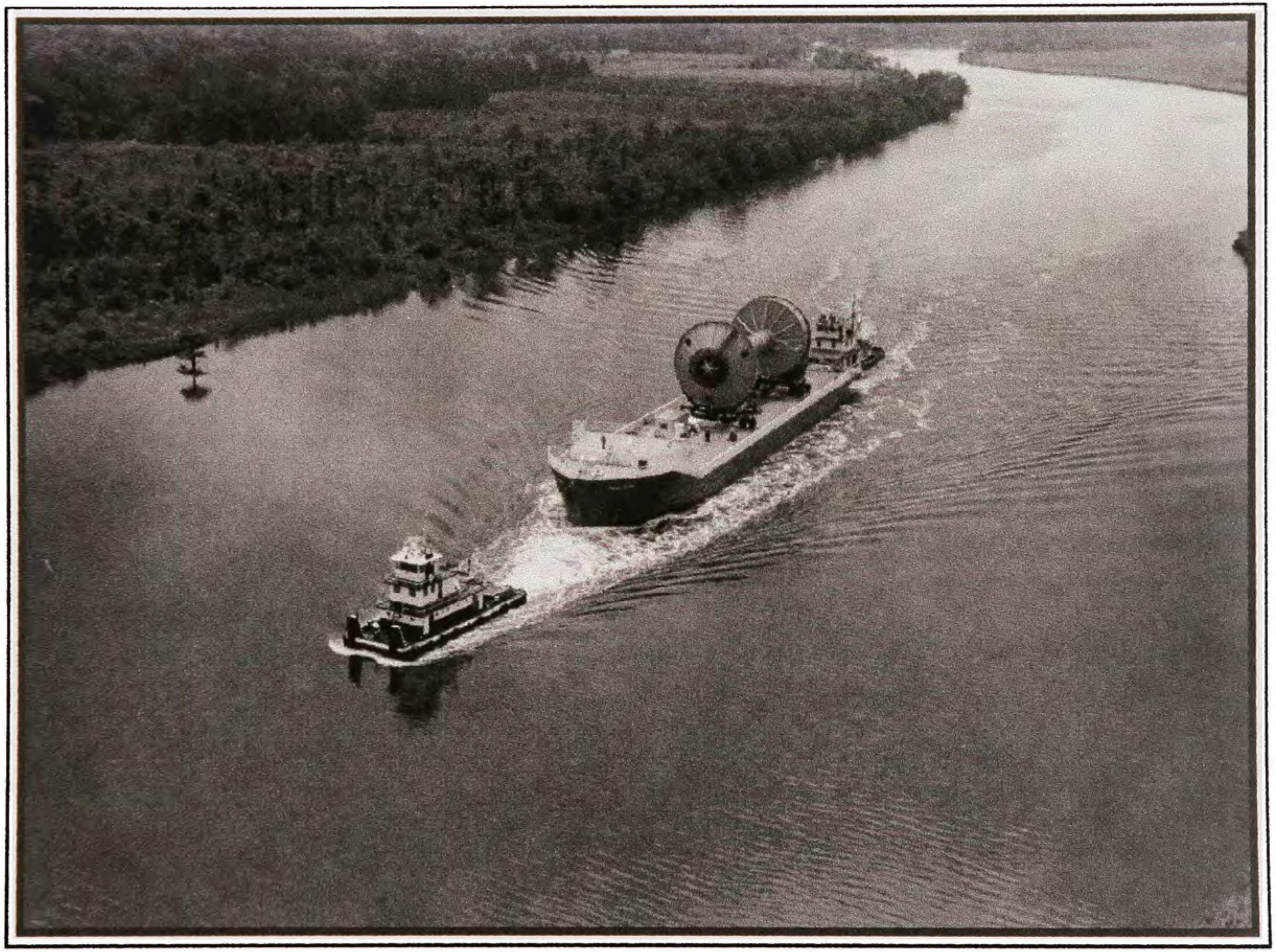


Figure 13-9. Transport of a Saturn rocket booster from Michoud, Louisiana to the MTF via the East Pearl River (Public Affairs, MDO).

Figure 13-10. Cranes lifting the Saturn rocket booster for placement in the test stand at MTF (Public Affairs, MDO).

Figure 13-11. Test firing of the Saturn rocket booster at the MTF (Public Affairs, MDO).

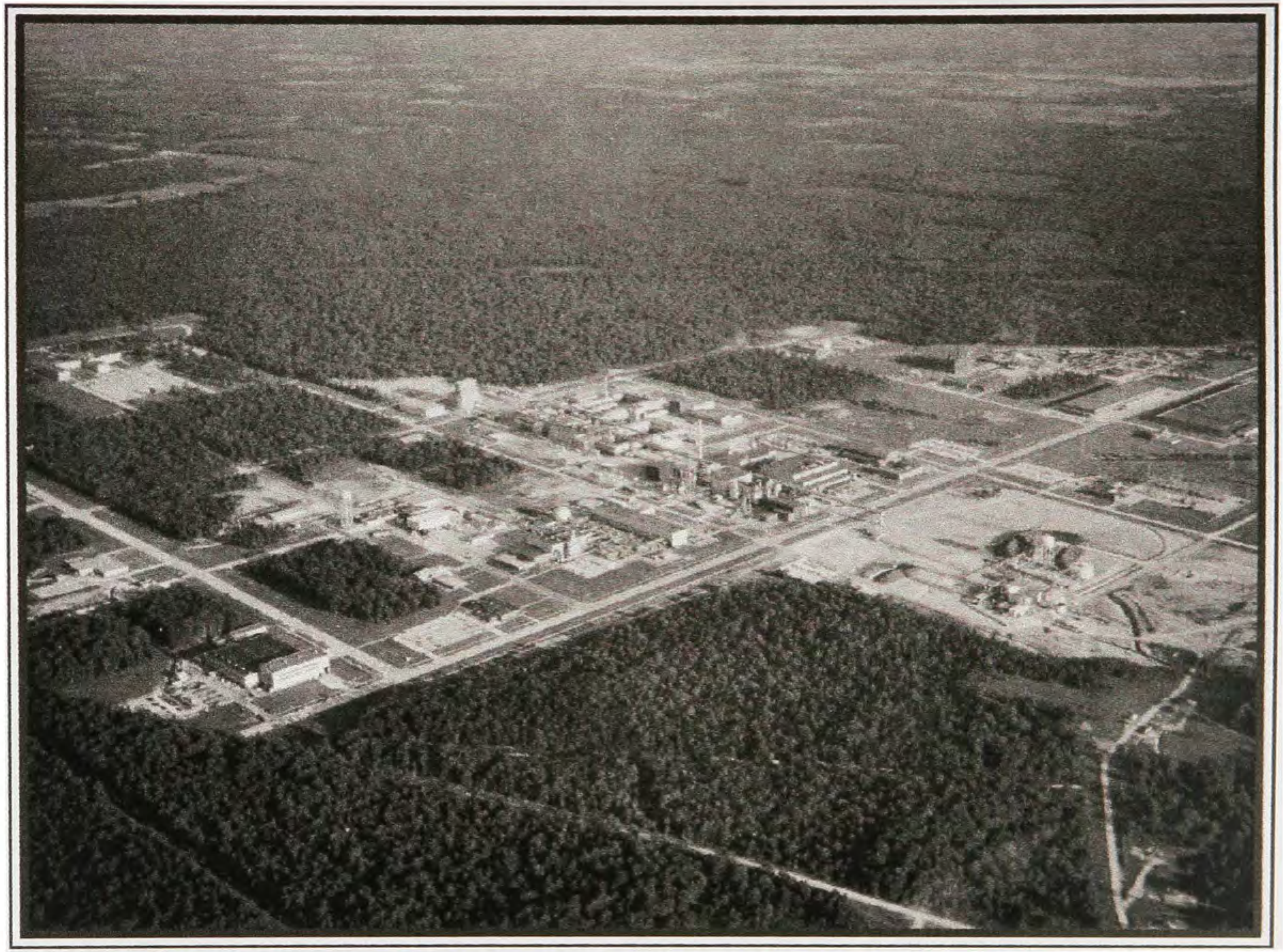


Figure 13-12. Aerial view of Arnold Engineering Development Center, Tullahoma, Tennessee (Public Affairs, MDO).

One of the major projects making use of Mobile expertise was construction of the huge J-4 test facility initiated in 1961 (Figure 13-13). The high-altitude rocket cell was state-of-the-art technology at that time. The intent was to construct a cell where a complete missile, with engines installed and operating, could be tested in an upright position. Thus, the phenomena occurring in the course of a missile's flight through the stratosphere could be studied without loss of the missile itself. As the engineering design and construction agent for the project, Mobile District had to design a facility capable of withstanding thrust pressures of 500,000 pounds at a simulated altitude of 100,000 feet, and projected future thrust capabilities of 1.5 million pounds. Conceptual design became reality by 1964 when the chamber was placed into operation (Figure 13-14). The underground test chamber was 250 feet deep and 100 feet in diameter.

The largest single stateside military contract ever let by the Corps of Engineers was for construction of the Aeropropulsion Systems Test Facility (ASTF) at Arnold Center in Tullahoma. The facility, initiated in 1977 and built by Mobile District, was completed in 1984. The ASTF is a prime example of Mobile District's work for other agencies. When the Air Force designed the project and submitted its technical requirements to the Corps, the question was whether such a facility could be built. Since nothing like it had ever been built before, certain design elements proved to be flawed and required periodic alterations. For example, when some of the massive steel ducts (up to 65 feet in diameter) tended to sag under their own weight, specially designed shoring and bracing was added. In all, more than 750 changes were made to the original design.[15]

The specific elements of the ASTF test facility indicate the kind of changes that took place in Mobile District projects during the space age. While fewer in number, these projects were more sophisticated and more massive in design. Features of the ASTF include the following:

- Stainless steel air ducts large enough to drive tractor-trailer rigs through
- Lines of huge compressors the length of football fields
- The world's largest single butterfly valve (32 feet in diameter), used for wind control (Figure 13-15)
- Control rooms capable of simultaneously monitoring 2000 engine performance measurements per cell
- Dual test cells, 28 feet in diameter and 85 feet long, capable of testing rockets with 75,000 pounds of thrust at simulated altitudes up to 100,000 feet

The huge facility is the largest wind tunnel in the free world and will test full-scale jet and turbo-fan engines under normal and extreme flight conditions. It holds huge motors generating more than 500,000 horsepower that can move air through the tunnel at simulated speeds approaching Mach 4 (four times the speed of sound).[16] The system also can simulate temperatures that range from -150 to more than 1000 Fahrenheit.

Canaveral District

Responsibility for constructing facilities to support a growing U.S. missile and space research program logically fell to the Corps of Engineers in the months following World War II. The country needed a long-range testing and proving ground for implementation of all of the missile design work that was already accomplished. Cape Canaveral was selected and in mid-1950 the first construction for missile launch capability was initiated under the supervision of the Jacksonville District. Jacksonville was responsible for setting up an Area Office at Patrick AFB, a former Navy facility taken over by the Air Force, and located adjacent to Cape Canaveral.[17]

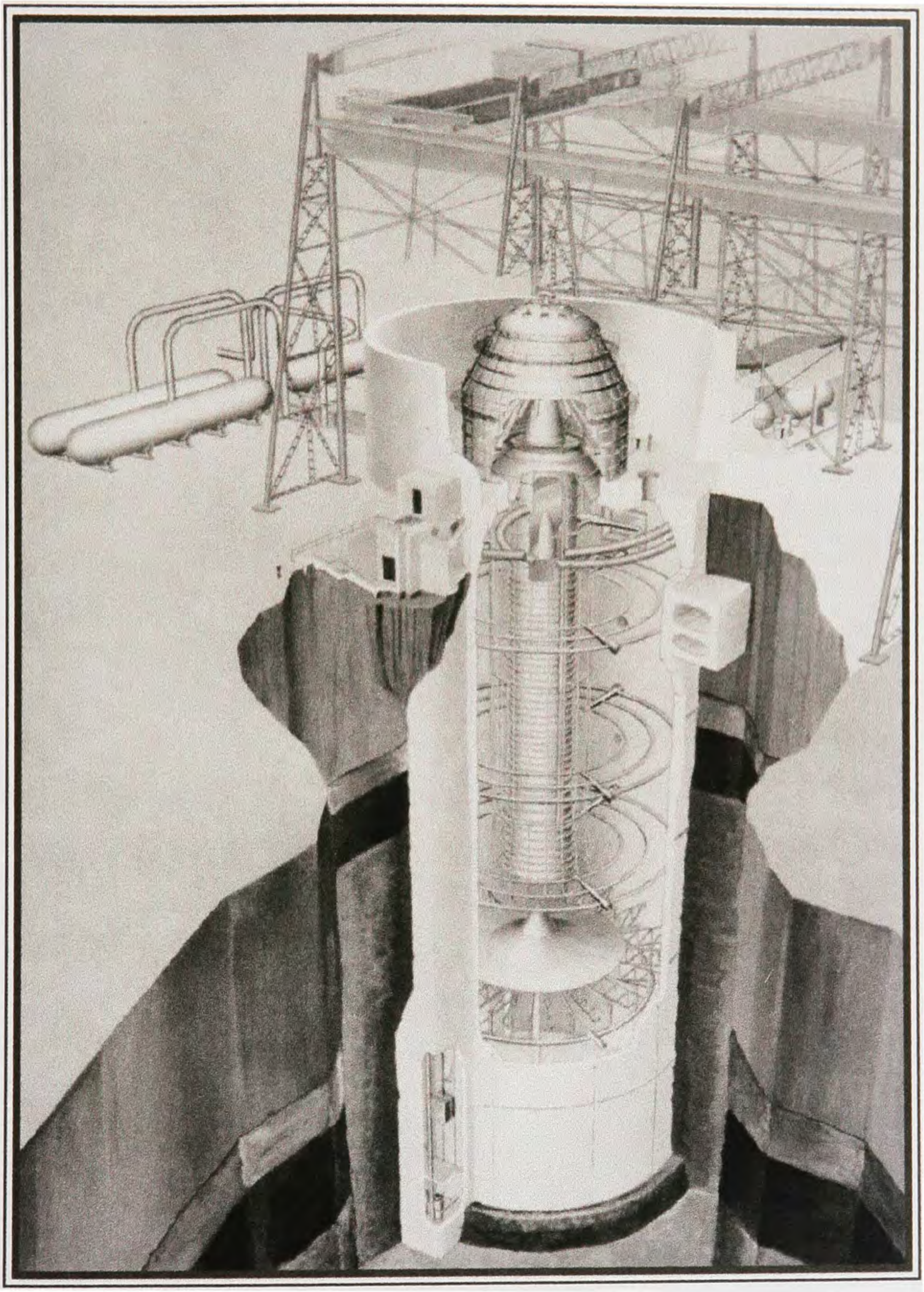


Figure 13-13. Artist's conceptual drawing of the J-4 Propulsion Engine Test Cell, Arnold Center, 1961 (Public Affairs, MDO).

Figure 13-14. Workman standing beneath the exhaust funnel of the newly completed J-4 Test Cell, Arnold Center, 1964 (Public Affairs, MDO).

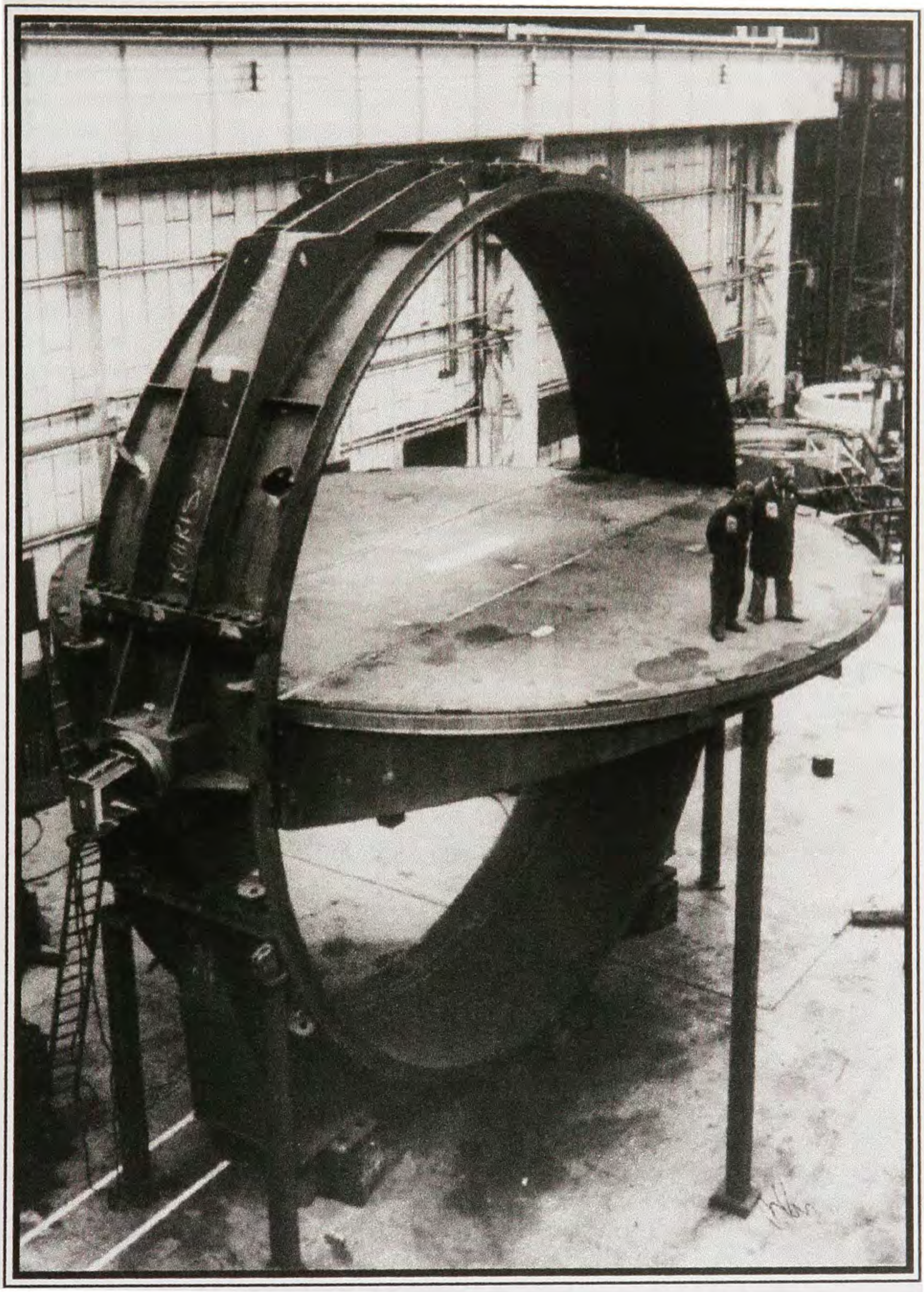


Figure 13-15. The world's largest butterfly valve (listed in the *Guinness Book of World Records*) used on the wind tunnel at Arnold Center (Public Affairs, MDO).

The testing related to the missile program's research and development activity in both Mobile and Huntsville was done at the Florida complex. The amount of work escalated along with the pressure for facilities to handle an evolving missile and space program. Between 1950 and 1963, the Jacksonville District was able to handle the demands. New demands, however, surfaced in January 1963 when Canaveral was designated to handle launching for NASA's Apollo series and the Air Force Titan III program. The Chief of Engineers decided that a separate District Office was needed to successfully manage the various programs. The Cape Canaveral District was formed on 1 May 1963.[18]

The organizational structure of the Corps of Engineers with its national network of Division and District offices has the ability to rapidly expand or retract in size based on the demand for its services. This flexible organizational structure has provided a significant advantage in meeting the nation's engineering needs, as was evident when the decision was made to create Canaveral as a separate District from Jacksonville. The latter had managed and administered construction of launch and support structures for Thor, Redstone, Vanguard, Pershing, and other missile programs up to 1963. The burgeoning construction of new space and missile facilities was well served by the Corps' and it was rational and prudent to continue to make effective use of the organization to accomplish these new national goals.[19]

By the mid-1960s, the construction workload for the Canaveral District began to decline. All of the major facilities for the space program at the Kennedy Space Center (in 1963 Cape Canaveral was renamed Cape Kennedy in honor of President John F. Kennedy) were completed by 1967 and the waning construction demands called for a greater economy of scale.[20] The 1963 work force of 340 people was reduced to 120 by 1970. In early 1970 personnel services were managed by the Jacksonville District; in August 1970 they were transferred to the Mobile District, along with responsibility for other functions including Safety and the Office of Counsel and Administration.[21] The Canaveral District was ordered to be discontinued effective 30 June 1971. By July the Florida Area Office was part of the Mobile District, with responsibility for supervising construction not only at the space complex but also at Homestead, MacDill, and Patrick Air Force Bases.[22]

Why operations were shifted from Canaveral to the Mobile District cannot be answered definitively, however, much of the rationale relates to the organizational structure of the Corps. When the Canaveral District was created, the commanding officer drew on not only the Jacksonville District office but a wide range of Corps locations, including headquarters in Washington, for the best personnel available.[23] When the District's workload began to decrease in the late 1960s, many people were reassigned. While they were sent to various locations, a number of the Engineers were transferred to the new Huntsville District that had been created out of Mobile District territory.[24] Mobile's involvement in the missile program research and development at Huntsville gave the Mobile District Office a closer link with operations in the Canaveral District than the Jacksonville office, which had few responsibilities at all for the missile or space programs after 1963. From an organizational standpoint, the Mobile District Office was better prepared to manage the necessary construction. Furthermore, all military construction was transferred from the Jacksonville District to Mobile in 1970, including that for the Panama Canal Zone and Central America (Map 13-1).[25]

One of the chief space program projects Mobile District has handled since 1971 is the rehabilitation of the Solid Motor Assembly Building for the Shuttle Payload Integration Facility (SPIF) (Figure 13-16). The original building "was used for stacking and mating of solid rocket motors to the Titan Air Force heavy launch vehicle."[26]

Map 13-1. Mobile District Military Boundary (MDO).

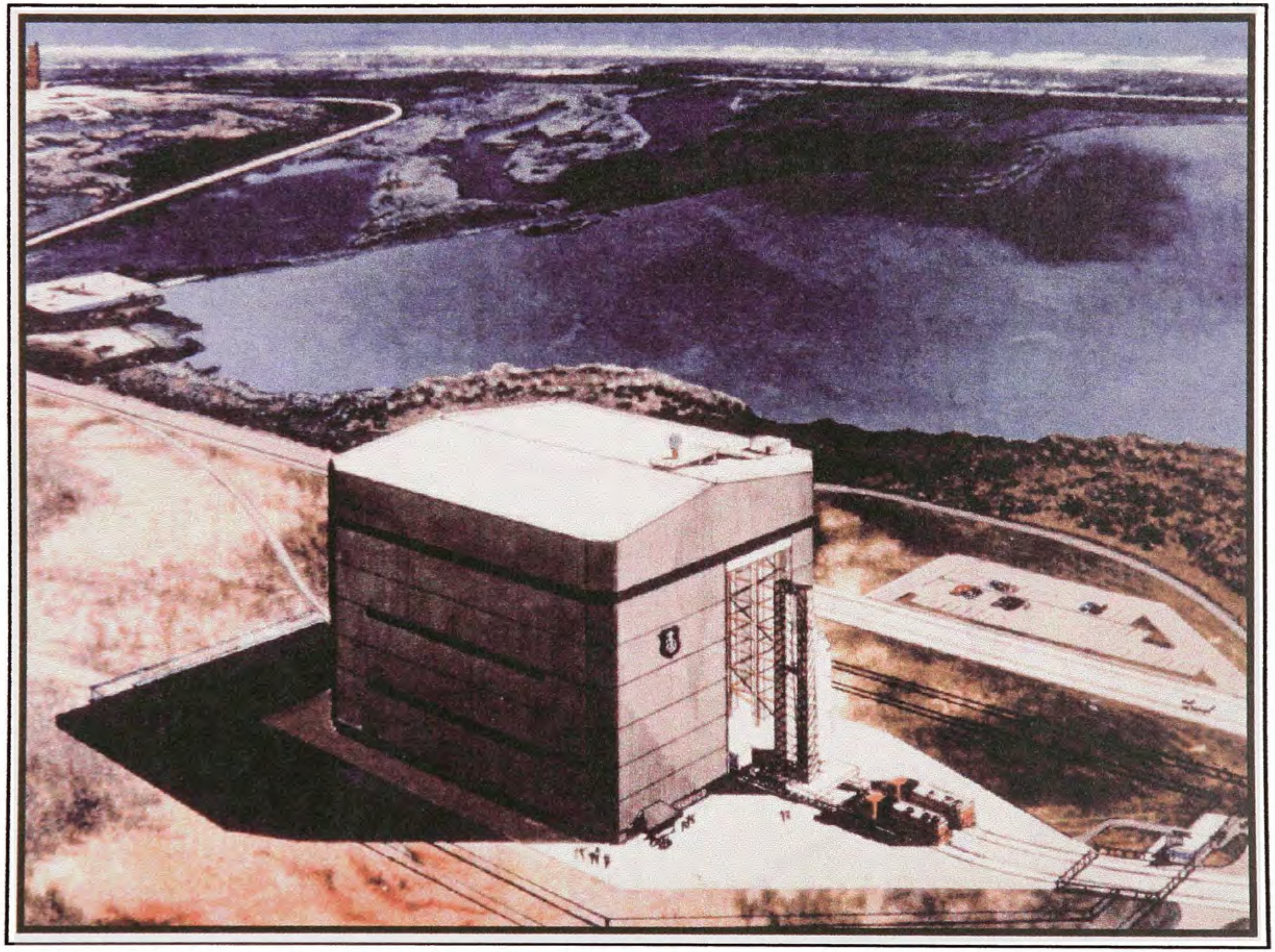


Figure 13-16. Exterior view of the Cape Canaveral Solid Motor Assembly Building interior rehabilitation (Public Affairs, MDO).

Payload and booster integration originally took place at the launch pad. The complexities of the Space Shuttle program checkout procedures, plus the security and environmental protection required by the Air Force, could no longer be handled at the launch site. Therefore, rehabilitation was necessary. Because the work was critical to the rapidly evolving shuttle program, the project received priority rating 17 July 1981. The job required gutting the 22-story tower and its flanking 16-story wings (Figure 13-17).[27] The completed project provided the Air Force with the largest radio-frequency-shielded class 100,000 clean room in its inventory. The Mobile District completed this massive undertaking on time to meet Air Force requirements.[28]

Military Operations in Central America and the Caribbean

The Mobile District has provided planning, technical, and disaster assistance support to Central America since June 1970. Real estate acquisition and design/construction of military projects also are included. The District has provided support, for example, in such areas as water-well construction, road design, and soil testing. In addition, Mobile has provided disaster relief following earthquakes; constructed bridges to link the vital Pan-American Highway segments; helped improve sources of potable water; helped build water distribution systems; and developed sewage treatment facilities.[29]

Panama Canal

One of the most significant responsibilities acquired from Jacksonville was for the Panama Canal Zone. At the time of transfer, the zone consisted of a ten-mile-wide strip of land equally divided on both sides of the canal. In October 1979, most of this territorial strip was transferred to the Republic of Panama. The remaining military installations (Army, Air Force, and Navy) were redesignated Panama Canal Defense Sites, which eliminated the politically sensitive term "Panama Canal Zone." All remaining defense sites were handed over to Panama in the year 2000.[30]

Between June 1970 and November 1977 the major workload associated with the canal consisted of $20 million in barracks modernization.[31] Considerable activity followed the decision to return the canal to Panama. Certain facilities would be transferred to the Panamanian government; this required repositioning of troops on military reservations still under U.S. control.

After the treaty transferring ownership of the Canal Zone was ratified 18 April 1978, Mobile District became involved in the programming and design of emergency projects necessary to accommodate relocated personnel. Temporary facilities were completed in time for occupancy by 1 October 1979; contracts for construction of permanent facilities were awarded in March 1980 and work was completed in March 1983.

Changes in U.S. foreign policy and force reorganizations in 1983 resulted in a reevaluation of facilities that would be needed to maintain current U.S. initiatives in the region. Increased requirements for housing, training, and support facilities resulted in a crash program of construction. Construction was under way by April 1984 and additional projects were funded through 1988; the single largest military construction project involved extending the aircraft parking ramp and fueling capabilities at Howard Air Force Base (Map 13-2).

In addition to its various military construction and support responsibilities, in 1984 Mobile District received a civil operations request from the Panama Canal Commission (PCC) to prepare a study concerning the feasibility and cost of widening the Gaillard Cut on the canal. The problem related to congestion caused by larger vessels and potentially reduced

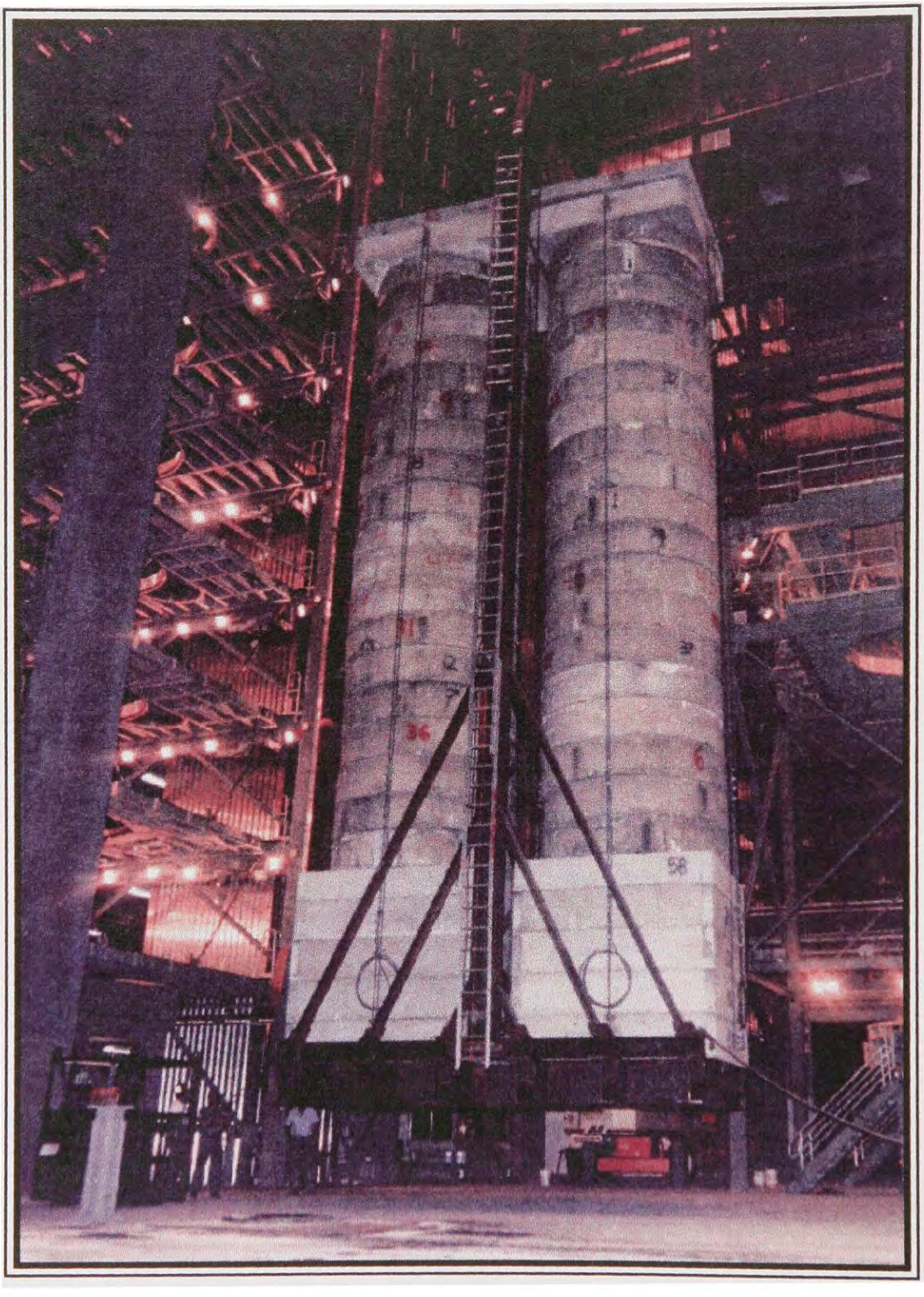
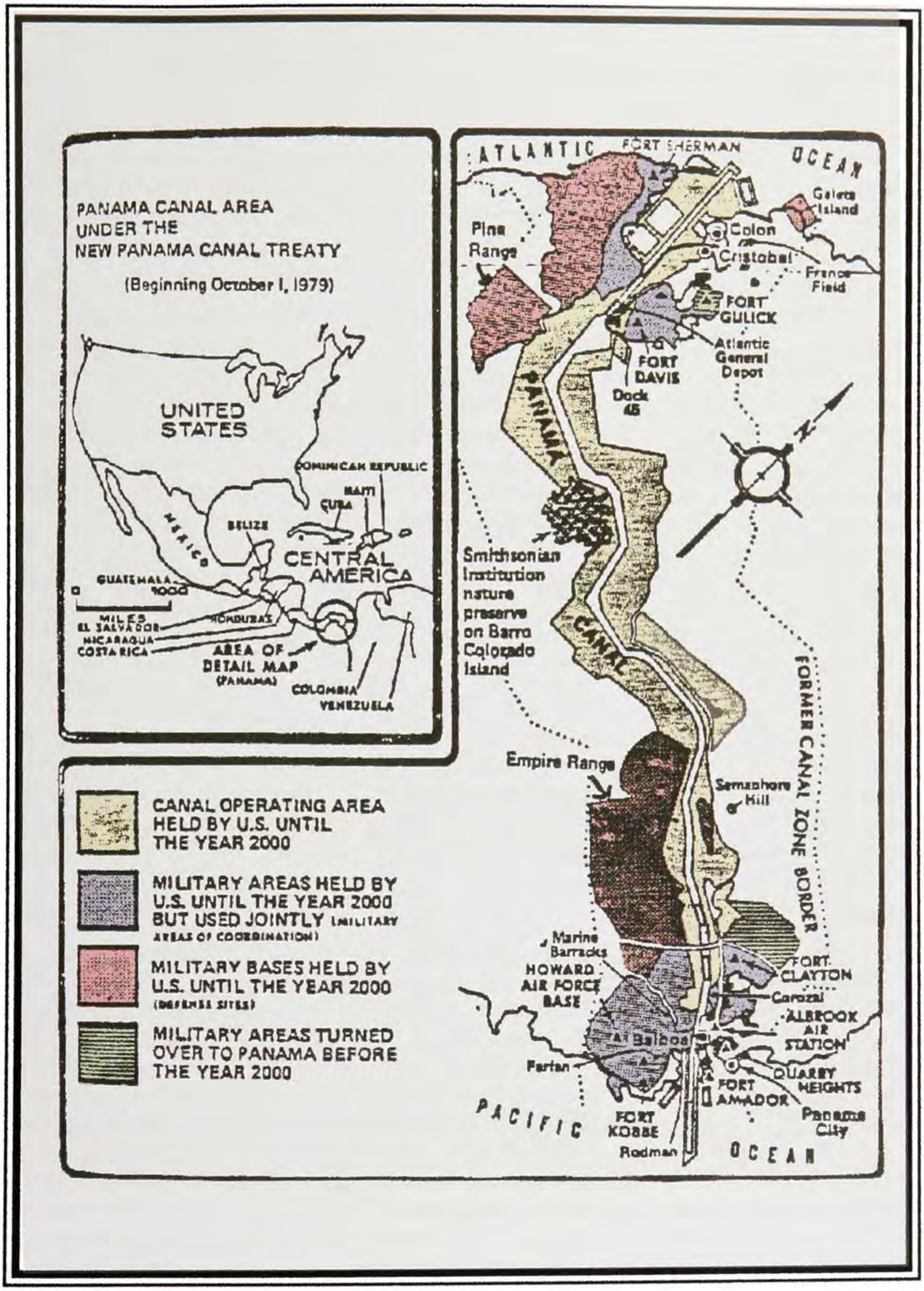


Figure 13-17. A view of the interior of the Cape Canaveral Solid Motor Assembly Building after rehabilitation.



Map 13-2. The Panama Canal area under the new Panama Canal Treaty (MDO).

capacity in this canal section. The Gaillard Cut had experienced mammoth landslides during construction, which continued albeit on a smaller scale. A preliminary investigation performed by the South Atlantic Division in July 1984 estimated that the study requested by the PCC would take 14 months and cost approximately $1 million.[32] The preliminary report estimated that 31 million cubic yards of material would have to be moved to widen the cut to 150 feet. A team of nine or ten experts in various disciplines were needed to perform the study and report back with a comprehensive construction feasibility document detailing cost estimates and recommendations for accomplishing the work.[33] The project was delegated to the Mobile District and set for completion in 1986.

Honduras

Mobile became involved in Honduras in March 1982 when it accepted an Air Force mission to upgrade existing airfields (Figure 13-18) In-house design began in May 1982 for Palmerola and Goloson (Map 13-3); $21 million in construction was completed at Palmerola in December 1984 and work at Goloson was scheduled for completion by July 1986. Mobile improved runways, taxiways, parking aprons and security facilities at these and other airfields.

In addition, master plans were developed for Palmerola, Goloson, and La Mesa airfields and for the Regional Military Training Center (RMTC) at Trujillo. The RMTC contract was awarded in May 1983 and the Mobile District administered operations and maintenance until the Honduran government discontinued troop training there in June 1985. Improvements included replacing tents with more substantial housing, cooking, and dining facilities, and improving the electrical and water systems. Funding for additional projects was anticipated by 1988 for such security items as fencing, closed-circuit television, and intrusion alert devices.

El Salvador

In August 1984, Mobile District was assigned responsibility for the design and construction of a $1 million heliport complex at the existing army compound of San Miguel in El Salvador (Map 13-4). It was designed in-house and construction was completed 25 June 1985. Additional military projects in that country included security, range, cantonment, and naval improvements. Along with disaster relief, civil projects were approved for completion after June 1985.

Grenada, West Indies

Mobile District played a minor role in the aftermath of the U.S. invasion of Grenada. In November 1983, the acting ambassador to Grenada requested through the U.S. Secretary of State that a Corps real estate team provide claims assistance for damages to properties as a result of military use during the invasion.[34] A three-person team from Mobile's Real Estate office was in Grenada from 21 to 29 November 1983 to help resolve two problems faced by U.S. Armed Forces in the area. First, several hotels and other buildings occupied without formal agreements had to have their occupancy formalized through leases until long-term contracts took effect. The authority to negotiate the leases existed under Real Estate regulations (AR 405-15), and seven hotels and/or other buildings were leased for the first few days of occupancy until contracts negotiated by the Comptroller took effect. Second, the Staff Judge Advocate (Fort Bragg, 18th Airborne Corps) felt that real estate claims submitted to the claims office established in downtown St. Georges, Grenada, would be best handled by Real Estate personnel under Army regulations. No claims were paid for "war damages" during the conflict period from 25 October to 3 November.[35] Two people from the Mobile District made subsequent trips to Grenada from 12 to 19 December 1983

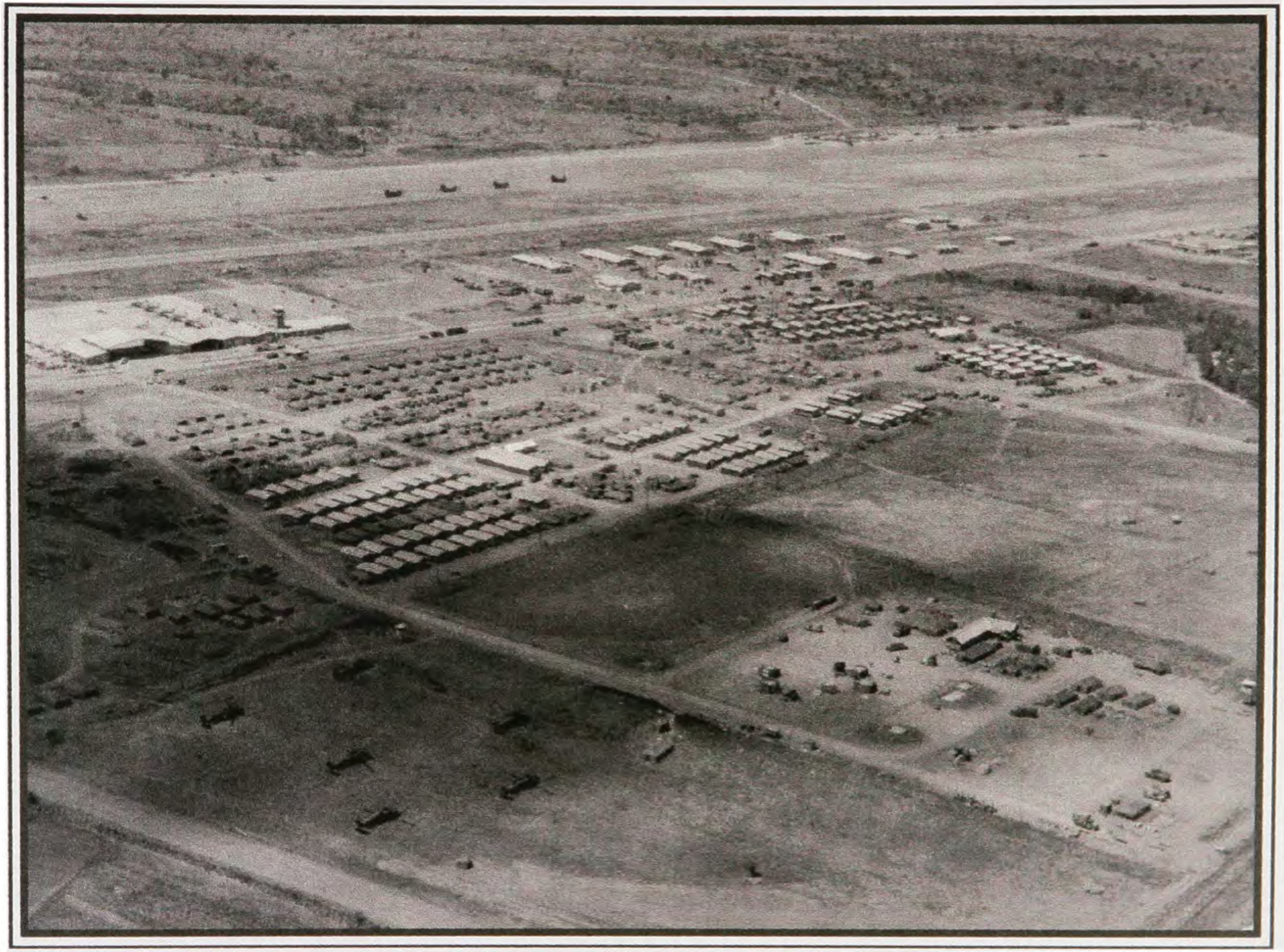
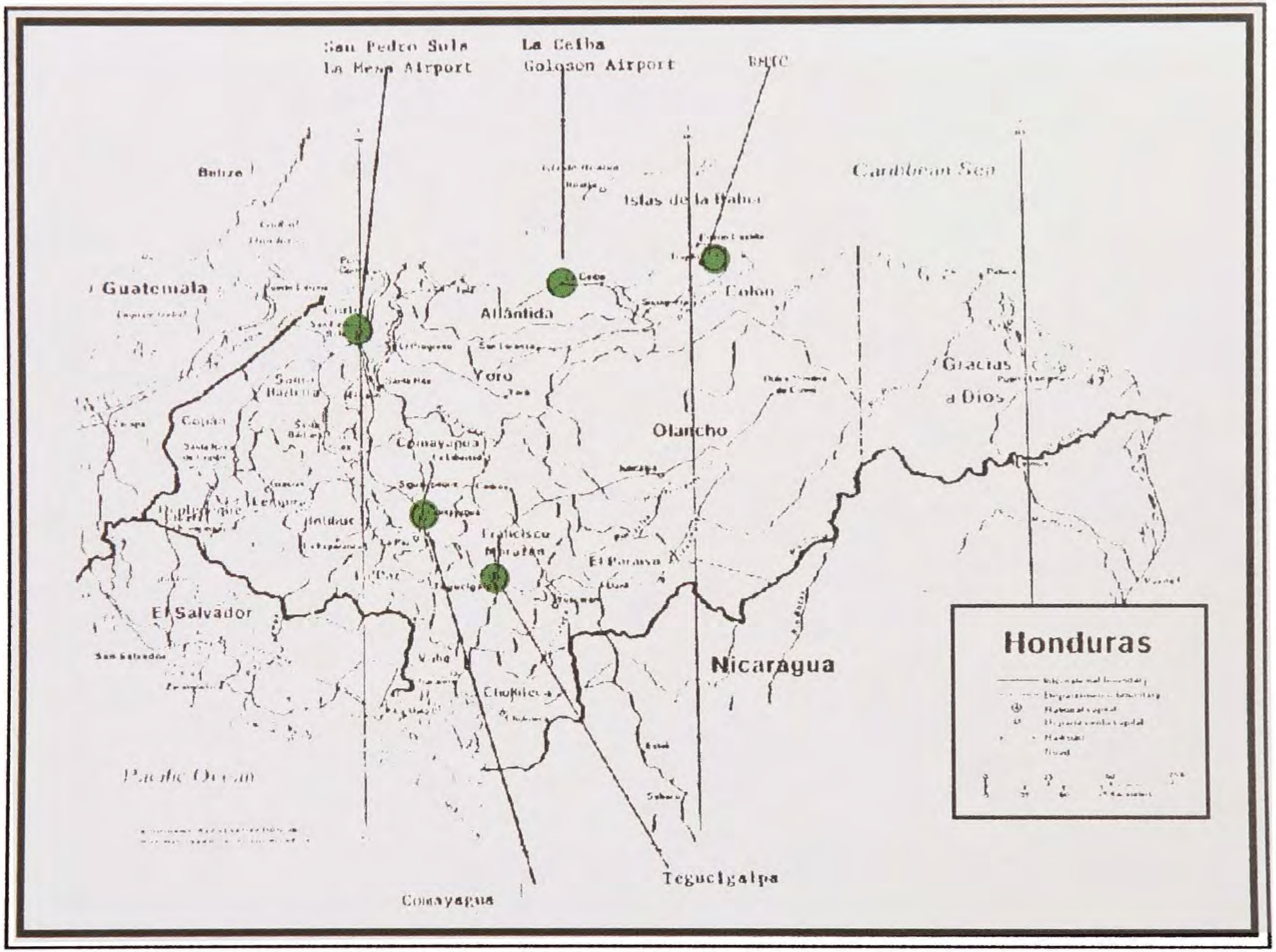
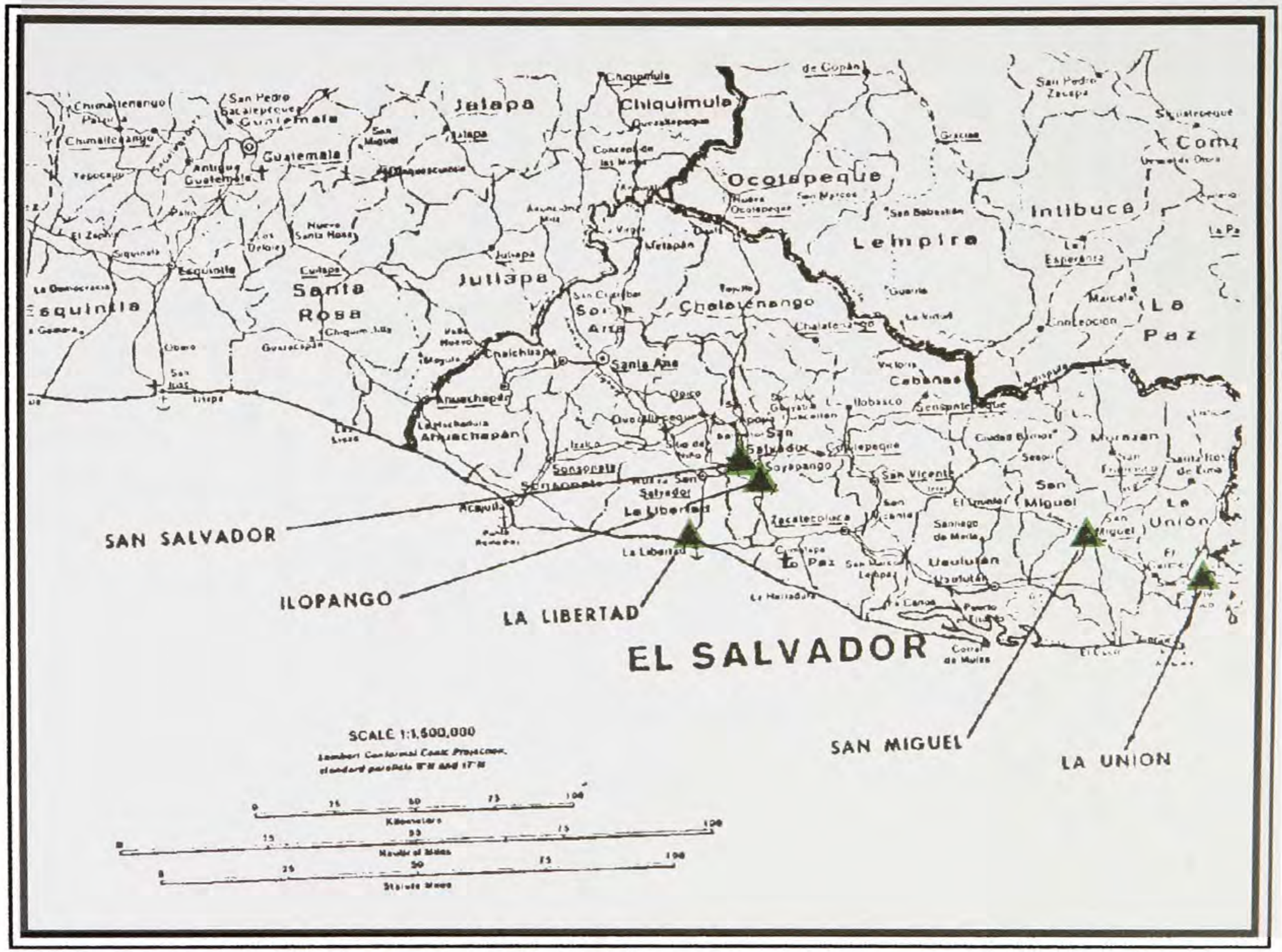


Figure 13-18. A military airfield in Honduras (Public Affairs, MDO).



Map 13-3. Military construction sites, Honduras (MDO).



Map 13-4. Military construction sites in El Salvador (MDO).

and from 24 to 28 January 1984. During Mobile's involvement, 38 leases were completed at a cost of $166,230. The Chief of Engineers provided an assessment of real estate problems facing the Government of Grenada.

In 1985, the Chief of Engineers appointed the South Atlantic Division as the center of all Engineer support for Southern Command (SOUTHCOM) in Central and South America. Mobile District was designated by the division commander as the chief field operating agency. This promises an increased role for the Mobile District in the future development of the region as it stands ready with the South Atlantic Division to respond to any SOUTHCOM engineering requirement for the critical Latin America mission.[36]

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1 Interview, Frank Deming, Chief, Engineering Division (Ret.), Mobile District Office, September 1984.

2 James H. Kitchens, *A History of the Huntsville Division, U.S. Army Corps of Engineers, 1967-1976* (Huntsville, AL U.S. Army Engineer District, 1978), p. viii. This is the most complete material on the development of the Nike program as it affected the Mobile District, and the author has paraphrased liberally from the Kitchens' history. Hereafter cited as *History of the Huntsville District.*

3 Ibid.

4 Ibid., p. ix.

5 Interview, George Phillips, Chief of Military Branch, 1969-1980 (Ret.), Gulf Shores, AL, 24 September 1984.

6 *History of the Huntsville Division*, p. x.

7 Ibid., p. xi.

8 Ibid., p. xii.

9 Phillips interview.

10 Deming interview.

11 Interview, Willis E. Ruland, Chief, Environmental Branch (Ret.), Mobile District Office, 25 September 1984.

12 *Mobile District History*, pp. 78-81.

13 Ruland interview.

14 Ibid.

15 Samuel R. Green, "Terrific Tunnel at Tullahoma," *Mobile, U.S. Army Corps of Engineers, Mobile District*, Vol. 6, No. 3 (March 1984), p. 3.

16 Ibid., p. 4.

17 *History of Canaveral District, 1950-1971* (Atlanta, GA: U.S. Engineer Office, South Atlantic District, July, 1971), p. 1.

18 Ibid., p. 25.

19 Ibid.

20 Ibid., p. 90.

21 Ibid., p. 94.

22 Ibid.

23 Ibid., pp. 25-29.

24 Ibid., p.94.

25 Unpublished summary material provided by Military Program, Development and Management Branch, Engineering Division, Mobile District Office. No date. Hereafter cited as Military Program, MDO.

26 Winnie L. Smith, "SPIF Nears Completion: $24 Million Project Supports Space Program," *Mobile, U.S. Army Corps of Engineers, Mobile District*, Vol. 5, No. 6 (June 1983), p. 4. Quote is from William W. Brubaker, area engineer for the project.

27 Ibid. p. 5.

28 Ibid.

29 Military Program, MDO.

30 Unless otherwise noted, the author has paraphrased the material provided by the Military Program at MDO. Because none of the material is dated, numbered, or credited, repetitive endnotes are superfluous.

31 This was further substantiated in a personal interview with George Phillips. In addition to barracks construction, recreational facilities were constructed in the Canal Zone. Phillips recalled that operations were similar in other areas of Central America, with additional responsibilities for troop support such as air strip construction. Phillips interview.

32 *Panama. Panama Canal Commission Study.* Document provided by Military Program, MDO. No date.

33 Ibid.

34 Information paper, Director of Real Estate, Office of the Chief of Engineers, 21 March 1984. This document summarizes Mobile District's involvement in the Grenada affair. The document was provided by the Real Estate Division, Mobile District Office.

35 Ibid. The arrangement for determining which leases would fall under AR 405-15 and which would fall under AR 27-20 was worked out by LTC John Weber, the Staff Advocate General, and Donald L. Burchett, Chief, Real Estate Division, Mobile District.

36 Information on the status of Mobile District as the chief field operating agency for SOUTHCOM was provided by the Military Program, Development and Management Branch, Engineering Division, Mobile District Office.

Appendix I.

Order Sending First Engineer to the Gulf Coast, 1815

Lieut. H. Dumas — New York May 4th, 1815

Corps of Engineers

Sir,

You will proceed to Mobile and New Orleans and examine the state of the works erected for the defense of those places, which you will report to me, together with the requisite plans and estimates for the repairs to place the works in a permanent state of defense. You will examine water courses, roads, and passes, leading to and from Mobile and New Orleans and will select positions on which it may be necessary to erect works for the additional security of the before mentioned places. I wish a good topographical map of the country from Pensacola to Lake Barataria, west of New Orleans. You can correct Lafour's map by your own observations, and particularly note all positions that have military advantages, including good air, water, and communications. Procure answers to the following questions. 1st. What draft of water can be carried thro' Lake Ponchartrain into Lake Maurepas, and what natural facilities there are to communicate with the Mississippi from the point of Lake Maurepas nearest the river. The Secretary of War requires you to "report to him the means that have been taken to secure, and the preservation of the artillery and other public property at the several forts and fortifications in your district, and also the number of men that would be necessary on a peace establishment to be kept at each fort." A copy of the above required report you will enclose to me.

Appendix II. Future Directions

Colonel C. Hilton Dunn

In June 1985, I completed almost a year of using my "idle time" to study and reflect on what I had learned from my first 20 years of service that would be helpful for the next three. My continued education program took me through the current emphasis on quality (exemplified by Tom Peters' books), through some of the writings the Corps historians had put together based on interviews with prominent former military and civilian personnel, and on a few visits of my own to people and places I felt enriched my perspective and made the transition into the Mobile District as efficient and productive as possible. Prior to arriving in Mobile, I wrote many of my thoughts down that would help me draft a vision for the Corps, and the District's, future and execute it. It was my intent to listen to my senior staff, share my initial vision, and seek to forge a shared vision with their assistance.

My vision is the product of a risk assessment which I completed after studying trends I felt would have the most impact on future operations of the Corps. My scanning also led me to conclude that the hot items on the District's agenda during my tenure would be the consent decree and change management. The latter would address weaknesses in the way the Corps was operating relative to the needs of our customer now and in the future and to posture the Corps for future prosperity.

Consent Decree

We were coming to the end of a six year decree in which goals for employment of Blacks needed to be met. Although the numbers indicated positive progress, there were major challenges at higher grades and with some of the programs that would send strong signals of a true intent to comply with the spirit of the decree. It was obvious that extraordinary effort would need to be applied to reach the more senior grade hiring goals. Achieving these goals was a major short term mission assigned to me by the Chief of Engineers.

Change Management. Change is inevitable and is consciously accelerated when the risks an organization faces threaten its survival. *I reached the "conclusion" that the Corps had to undergo a change more dramatic than the environmental era accommodation of the 1960s/70s if it is to progress, much less prosper*. I based that conclusion on the following beliefs:

a) **We no longer have captive military or civil customers** since cost sharing is on the horizon in civil works and Army and Air Force will have alternatives to the Corps doing their work.

b) **The role Federal agencies will play will steadily decrease** and privatization will get bigger, not smaller.

c) **Our current way of managing projects/studies is about 30 years outmoded** since it was created to build "projects that would last forever" and is too inflexible to meet the national challenges facing the country today and into the 21st century.

d) **We must become more efficient and productive**, begin to really look at overhead and how we charge costs to products. We, like the country, are running a poor second (or worse) in productivity and cost consciousness.

e) **The differences between the private and public sectors' ways of operating will have to become less extreme** — we need each other too much to let the lack of true partnership remain. Many political hurdles stand in the path, but the journey has to be taken.

f) The mix of civilian and military leaders is one of our greatest strengths; still, that mix has a downside. **The differences in Corps subcultures (primarily civilian/military) is affecting our capacity to change and posture ourselves to be asked to take on future national challenges.**

g) **The national problems with energy, waste, groundwater, and the like will demand a different type of Corps of Engineers**, one with a lean but capable professional work force and more project managers able to reach out to the private sector for the majority of services.

h) **If we do not change we will wither or become marginally effective in responding**. We'll become just another Federal agency and lose most if not all of our military leadership.

Having decided that a major organizational/cultural change was necessary, I planned to try to obtain as much consensus with the need for change and its rationale as possible, through input of senior civilians, and then develop a plan of action to accomplish the change. I believe that the toughest parts of change management are fourfold:

1) the recognition of the necessity for major cultural change for future Corps prosperity;

2) the agreement among political power brokers (Army, hill/local politicians and the Executive Branch) that the Corps is a key agency in the execution of missions crucial for national survival;

3) the selection of military and civilian leaders willing and capable of undertaking the change management task (not only military officers and civilians but hopefully a Secretary of the Army and Assistant Secretaries with a similar vision for the Corps); and

4) a willingness to take the time (years) it takes to carry through on the complex task of changing individual and group behaviors to achieve the type of Corps culture needed in the twenty-first century.

The Role of the District Engineer

The role of the District Engineer as a change manager will take many forms. The most difficult component will be assisting the subcultures to achieve "buy-in" on concepts of what is right for the organization. Many organizations have to deal with subcultures, but I'm not aware of any that have to juggle so many. The Corps of tomorrow will have to help blend the reciprocity factor of the Congressional power group with the efficiency/effectiveness focus of the private sector and the national defense focus of the "green" Army. The extent to which these varied perspectives pull the Corps in opposing directions will only impede national prosperity and security.

Internally, the rifts among our military and civilian cultures need to be healed through development of a partnership based on shared professional values. The clash of subculture ethics is manifested in decision-making and in the way we define excellence in the products produced.

The actions needed to realign the organization and put it in a position to succeed in future missions include more opportunities for civilians to be trained in and practice leadership in addition to management. Concurrently, a continuation of the shift in leadership style from an emphasis on short-term gains, aggressiveness and confrontation to one which is more participatory, developmental, team-oriented and long-range in focus will assist the development of a closer civilian-military partnership.

In addition, we must shift from "stovepipe power" centers to a life cycle project/study management system for military, civil and support for others' work. The invasion of power centers brought about by increased lateral communication and a life cycle project management system will severely test the organization. More than one agency has proven unable to break the functional power mold even when results from management change have yielded increased effectiveness and product quality. One key to overcoming turf battles and unlocking the power struggle is to give a senior civilian the role of Chief Project Manager — allowing a civilian to have, along with the Commander, an integrating function of major consequence to the future of the organization.

Consistent with this, the civilian chiefs should meet as a "Corporate Board" to review the work of the Project Managers and act on matters of major concern. While the Commander serves as Chairman of the Board, s/he allows the senior civilians in the organization to seek consensus in making decisions in the best long-term interests of the Corps (decisions on manpower, budget, and resource trade-offs when managers vie for priority under a project management system). As the traditional stovepipe power is diffused to make way for more integrated, life cycle methods, the void is filled with a new respect by military commanders for civilian leaders participating in the corporate board structure. [There are many other ways that mutual respect can be achieved at very little cost; e.g. treating visiting senior civilians in similar manner to division commanders. Such attentiveness by commanders will provide positive evidence that civilian culture is equivalent to and deserving of as much respect as the military.]

In order for *mutual* respect to come about, the Commander has to establish a climate of trust based on candor and respect of the individual and demonstrate expertise in leading the senior management team. S/he must also shed some entrenched beliefs that sharing power is a sign of weakness; civilians must be allowed to share their knowledge and implement their experience within the parameters given them. Candor involves the risk of creating tension in decision making, yet it is necessary for success in a participatory culture. In addition, constructive tension is professionally healthy. The Corps cannot afford the waste associated with "end runs" or "waiting out" any more than the nation can afford unnecessarily protracted projects for political gain. Cultural change is evolutionary; it cannot be ordered. Given the years it takes to accomplish change in human behavior, the decision to alter management styles has to be a lifelong professional commitment for both civilian and military leaders.

Civilians question a new Commander's motives for change, wanting to be sure that a Commander is not instituting change for the sake of change, or for personal gain. The same historians who pointed to the Corps' rapid response to the environmental movement are waiting to see if the civilian/military leadership within the Corps and the key power brokers outside the organization are able to respond to the larger change challenges facing the Corps of Engineers now.

Vision

A central theme was needed to give the change management effort focus. The theme that best captures the essence of what I believe has to occur to improve the Corps is "Quality Customer Care."

Quality Customer Care

The theme of quality customer care has multiple parts, each of which is tied to the other, that have to be coordinated if the Mobile District and the greater Corps of Engineers organization is going to be successful in meeting future challenges. The Army Corps of Engineers is an Army command committed to quality engineering service to the nation in peace and war in service to its ultimate customer — the American public.

The Military Mission

Several items emerge as significant in assessing the future military mission. First, our peacetime contingency work in Latin America demonstrates the role the Corps can execute in support of national strategy. Nation building and security assistance are low-key, low-cost investments in increasing self-sufficiency for struggling nations and thereby enhance global security. Second, as military facilities continue to age, we must build "Communities of Excellence" on our installations through meeting the installation's expectations as determined by their needs. Another item needing consideration is the growing environmental support needs of the Army; this is particularly important in the area of hazardous and toxic waste. There is simply not enough money or people to do all that should be done for the Directorate of Engineering Housing (DEH), Non-Appropriated Fund (NAF), Military Construction-Air Force (MCAF), or Military Construction-Army (MCA). Fiscal accountability is a reality and priorities must be established; we need a sound strategy for best use of our talents.

The Civil Mission

The primary emphases in the civil works program will be to develop new, viable, cost-shared water resources projects; provide for quality operations of existing projects; find innovative ways to repair or replace decaying structures; and manage our regulatory program. All these program components will be managed in an atmosphere of greater cost, schedule, and quality (defined as meeting customer expectations) accountability.

Further, new water resource related missions are a national challenge. Among the candidates are projects dealing with drought, changes in groundwater (both levels and volume), rise in sea level, and the like. A critical role will be played by people outside the Corps who must decide who will be given these missions. If it is determined appropriate to give the Corps such missions, then the organization must posture itself in order to effectively manage the challenges, thus underscoring public confidence in our ability to handle the job efficiently, effectively, and to the satisfaction of the customer.

Blending of Corps Traditional Military and Civil Missions to Support Army Ability to Fight Joint and Combined Operations

As the Army looks ahead at evolution of Air/Land Battle (ALB) doctrine it seems to me that it will be even more obvious than in the past that military operations short of and during execution of war will be linked to Corps missions. Decaying infrastructure stands out as a prominent example of a significant detractor from effective war preparedness. Extending the life of highways, bridges, port support facilities and military installations must be accomplished if ALB is to be viably executed. Finding affordable ways to do this is a national challenge. We must work to make the stakeholders conscious of the proven capability the Corps has to apply its civil mission heritage to such infrastructure efforts. A similar argument needs to continue to be made that Third World infrastructure support is an effective strategic combat power multiplier.

Support for Others Mission

A long-standing mission of the Corps is support for others, for related civilian programs (like the space program). The Corps will continue to accept work for others if it assists others in executing significant national programs or enhances the Corps' ability to perform its civil or military missions.

Future Missions Preparedness

While our current program continues, we must be prepared for broader missions in addition to those directly related to Army war fighting doctrine. The nation's needs in such areas as toxic and hazardous waste, power cogeneration, infrastructure, water supply, water and sewage treatment, groundwater, response to sea level and climate changes, space, public health care facilities, construction industry productivity, disarmament, peacekeeping, and counterterrorism continue to grow more acute. The transition of the organization from one whose heritage was built on "products to last for the ages" to one whose *21st century heritage will be built upon "flexible, effective management of varied, complex national engineering challenges*" is, in turn, the current Corps leadership challenge.

Accomplishing the Vision

There must be caring leadership, teamwork, and a shared trust. To perform our current missions with greater efficiency and effectiveness and to prepare ourselves for greater service (and perhaps new missions), the work of each segment of the organization must be coordinated to such a degree that the combined efforts produce an effect greater than that contributed by individual units. This requires enhancing internal cooperation, complete coordination, clear communication, and values-based decisions at every level throughout the organization. It involves reaffirmation of the importance of developing caring and inspiring leaders as well as strengthening our commitment to being leaders in customer care. This also means creating an environment that is open to innovation and that is exciting technologically and managerially. In short, it means enabling our people to bring forth their best. To do that, we have to align the values of many subcultures in a way which demonstrates respect for each other.

In addition to caring leaders and teamwork, there are certain organizational imperatives which are evident. Sharpening our cutting edge requires that we actively pursue greater efficiency and effectiveness in our operating processes. Program and project management will become a reality in the Corps as will accurate measurement of our cost of doing business. Authority subject to accountability will be the guiding principle in balancing decentralized operations with centralized policy control.

The blending of private and public sector cultures into a partnership is essential. Within the private sector, decision-making follows a fairly rational process: define the problem, analyze it, review alternatives, cost it out and select. Planning focuses on technology and productivity and success has some well-defined "bottom line" measures (sales, profit, and the like). The Corps world (especially on the civil side) operates by modified rules. The decision process begins rationally, but selection is frequently based on give and take — reciprocity. The politicized process makes major leader turnover inevitable on a grand scale every 2/4/8 years. "Planning" is really political expediency with a focus on budget cycles, election year priorities, and interest group pressures. And, Congressional intervention on a daily basis, so necessary in a democracy, wreaks havoc on managerial efforts to effect change. The need for increased national productivity dictates that these two worlds cannot go on forever without leveraging each other's resources. A true partnership will stretch the limited resources of each for maximum gain. This will likely be the toughest of challenges since political self interests and organizational futures are at stake.

The Future

Being the finest public service provider of engineering services remains the goal. It will take a Corps organization more flexible than the one which has served us for so long. The steps outlined here for reaching the goal, along with other initiatives, will prepare the Corps of Engineers for greater service. Will new missions come our way? I believe that they will, but only if we are prepared and have shown we can maximize what we have well. We *will* be prepared if we maintain and enhance our historical commitment to remain an organization in which "quality customer care" means: professionally competent; values-based; committed to public service; responsive and accountable to public policy; constantly seeking greater efficiency and effectiveness through innovation and self analysis; people-oriented and team-focused; and possessing leaders with strategic vision, moral courage, and a mutual respect for the powerful synergy derived for constructive civilian/military leadership "tension."

Based on the preliminary vision of quality customer care, I entered into the challenge of commanding the Mobile District. I sought to work constructively with the organization's leaders and employees to meet the challenge of the consent decree and to posture the District for future tasks while becoming more efficient and customer focused in producing its present products and services. During my tenure the Mobile District endeavored to build a shared vision and live it.

Appendix III. Engineers in Charge or District Engineers

Mobile District

MAJ C.B. Reese	1870-1870
CPT A.N. Damrell	1870-1870
COL J.H. Simpson	1870-1872
LTC W.F. Raynolds	1872-1873
CPT, MAJ and LTC A.N. Damrell	1873-1895
1LT Eben E. Winslow	1895-1895
MAJ W.T. Rossell	1895-1901,
Chief of Engineers,	1913-1913
CPT Spencer Cosby	1901-1903
CPT & MAJ W.E. Craighill	1903-1906
CPT J. B. Cavanaugh	1906-1906
MAJ W.E. Craighill	1906-1906
MAJ Henry Jervey	1906-1910
MAJ & LTC C.A.F. Flagler	1910-1913
CPT R.T. Ward	1913-1913
LTC Charles Keller	1913-1916
MAJ W.L. Guthrie	1916-1916
MAJ Frank C. Boggs	1916-1916
LTC Edward H. Schulz	1916-1916
MAJ W.L. Guthrie	1916-1917
CPT C.L. Sturdevant	1917-1917
Mr. G.K. Little	1917-1918
Mr. F.H. Reed	1918-1919
COL R.S. Thomas	1919-1920
MAJ Earl North	1920-1924
MAJ T.H. Emerson	1924-1928
LTC W.D.A. Anderson	1928-1932
LTC R.S. Thomas	1932-1935
CPT F.Z. Pirkey	1935-1936
COL Richard Park	1936-1940
LTC Willis E. Teale	1940-1941
LTC L.D. Worsham	1941-1942
LTC Doswell Gullatt	1942-1943
LTC H.I. Collins	1943-1945
COL Mark M. Boatner, Jr.	1945-1947
COL J.J. Twitty	1947-1949
COL W.K. Wilson, Jr.	1949-1952,
Chief of Engineers,	1961-1965
COL Harry L. Fox	1952-1954
COL Harold E. Bisbort	1954-1958
COL Robert W. Love	1958-1961
LTC and COL Daniel A. Raymond	1961-1964
COL Robert C. Marshall	1964-1967

COL Robert E. Snetzer	1967-1970
COL and BG Harry A. Griffith	1970-1973
COL Drake Wilson	1973-1976
COL Charlie L. Blalock	1976-1979
COL Robert H. Ryan	1979-1982
COL Patrick J. Kelly	1982-1985
COL C. Hilton Dunn	1985-1987
COL Larry S. Bonine	1987-

Montgomery District (Merged with Mobile District, 1 October 1933)

CPT R.L. Hoxie	-1889
CPT Philip M. Price	1890-1894
MAJ F.A. Mahan	1896-1899
CPT C.A.F. Flagler	1899-1900
CPT W.V. Judson	1901-1901
CPT R.R. Raymond	1902-1902
CPT J.B. Cavanaugh	1903-1907
CPT H.B. Ferguson	1908-1910
LTC G.D. Fitch	1911-1912
MAJ Earl I. Brown	1913-1915
MAJ Frank C. Boggs	1916-1916
CPT C.L. Sturdevant	1916-1917
Mr. James E. Turtle	1918-1918
COL W.D.A. Anderson	1919-1919
MAJ W.A. Johnson	1919-1921
MAJ J.J. Loving	1921-1924
MAJ E.A. Bethel	1924-1926
MAJ L.E. Lyon	1926-1930
MAJ R.A. Sharrer	1930-1933

(Names in **boldface** print indicate persons who served as District Engineer in both the Mobile and Montgomery Districts, either at separate times or concurrently.)

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Glossary

Fortification and Artillery Terminology

Abatis - Obstacles such as pickets, tangled tree limbs, or other items used to slow enemy advance on a fortified position.

Banquette - The step inside a parapet used by soldiers to stand on while firing.

Barbette - A gun platform, of mounded earth or other construction, upon which a gun can be mounted to fire over a parapet without an embrasure.

Barbette Gun - A gun mounted on a barbette.

Bastion - The part of a fort projecting at an angle toward the battle field, gives the advantage to defenders of being able to sweep their firing along the main walls of the fort.

Battery - A fort armed with artillery.

Breastwork - A quickly constructed, low earthen barrier, that soldiers can stand behind while firing.

Carnot Wall - A heavy, detached wall in front of a fort, loop-holed for fire, and sufficiently high to be a formidable obstacle. Troops attacking this wall had to ascend a long, gentle slope to the crest of the glacis, while being subjected to vertical fire.

Casemate - A bombproof structure in a fort, often used for cannon placement.

Chamber - The part of the bore that holds the propelling charge, in chambered muzzle-loaders of a smaller diameter than the bore.

Citadel - An interior central defense of a fort, or a fort within a fort.

Columbiad - A heavy, long-chambered American muzzle-loaded cannon.

Counterscarp - The exterior slope of the ditch.

Counterscarp Wall - A masonry retaining wall for a counterscarp.

Covered Way - A flat space behind the glacis and in front of the ditch.

Curtain - The wall of a fort between two bastions, towers, or other structures.

Demi-lune - An outwork that resembles a bastion with a crescent-shaped gorge.

Embrasure - An opening in a wall or parapet through which a cannon can be fired.

En Barbette - See barbette.

Enceinte - The main body of a fort, including the rampart and its parapet.

Enfilade - A type of firing directed from the flank of a line so that maximum damage may be inflicted along the length of the line, such as a trench.

Flank - The part of a bastion extending from the curtain to the face.

Gallery - Underground passage connecting the inner and outer parts of a fort.

Glacis - A long, gently sloping, earthen bank at the foot of a fortification that eliminates all dead space and helps make attackers visible from the parapets.

Gorge - The rear face, or opening, of a bastion, lunette, redan, or similar work.

Gun - A long cannon with a high muzzle velocity and a flat trajectory.

Howitzer - A short cannon intermediate between a gun and a mortar.

Lunette - An outward or detached piece of fortification consisting of two flanks forming a salient angle, with an open or partially closed gorge.

Mortar - A short cannon used for high-trajectory firing.

Parapet - A wall or elevation of earth or other material thrown up in front of a trench and used for observation as well as protection from gunfire.

Rampart - The large earthen wall on the inside of a ditch around a fortified position that forms the main wall of the structure.

Ravelin - A portion of fortification built outside the curtain of two faces meeting in a salient angle. Also called a Demi-lune.

Redan - A work constructed in front of the main fort, which is formed by two faces that form a salient angle.

Redoubt - A fortification of square or polygonal design that has no bastions.

Revetment - A masonry covering of an earthen embankment intended to resist the embankment's destruction.

Rifling - Imparting a spiral to a projectile as it travels along the spiral grooves in the bore.

Salient - An angle of a fort jutting toward the field, the point of a bastion is the salient angle.

Scarp - The rear side of the ditch surrounding a fort.

Terreplein - The horizontal surface behind the parapet where guns are mounted.

Trajectory - The curved path of a projectile after firing.

Traverse - A bank of earth used to provide protection from enfilade fire, sweeping fire, or to localize the effect of shell burst; usually placed across the covered way.

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Index

Entries that are *italicized* represent the names of the Corps' floating plant (with the exception of the airplane *Enola Gay*) used to accomplish the navigation improvements or rivers and harbors in the District.